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REPORT OF SAMPLING ACTIVITIES
AND ANALYTICAL RESULTS
RICHARDSON FLAT TAILINGS
SUMMIT COUNTY, UTAH
TDD F08-8903-06 - PAN FUT0039HDA
EPA ID UTD980952840

SITE ASSESSMENT

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DATE SUBMITTED: OCTOBER 13, 1989

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transferred into Supplemental Site Inspection Report submitted 12/20/89.

S. Kennedy 12/20/89

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~~SAMPLING ACTIVITIES AND ANALYTICAL RESULTS~~ REPORT

RICHARDSON FLAT TAILINGS

SUMMIT COUNTY, UTAH

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EPA ID UTD980952840

1.0 INTRODUCTION

This report was prepared to satisfy the requirements of Technical Directive Document (TDD) F08-8903-06, issued to Ecology and Environment, Inc.'s Field Investigation Team (FIT) by the Region VIII office of the U.S. Environmental Protection Agency (EPA). This report details sampling activities and provides a discussion of analytical results for samples collected during this ~~follow-up~~ site ~~investigation~~ (SI) at Richardson Flat Tailings in Summit County, Utah. The follow-up work was designed to support EPA efforts to respond to comments on the nomination of the site to the National Priorities List under the current Hazard Ranking System.

The FIT performed the field work from July 18 through July 20, 1989. FIT members conducting this investigation included Kevin Mackey, project officer; Steve Yarbrough, site safety officer and Dan Kenney, sampler. Site access was coordinated by Tom Burns of EPA and Regional ~~Council~~. Sampling procedures used during this investigation conform to requirements established in the Region VIII Standard Operating Procedures for Field Operations at Hazardous Waste Sites (SOP III-2 E & E 1989). The sampling effort was conducted under the approved Sampling Plan (TDD F08-8903-06).

2.0 OBJECTIVES

The objectives of the follow-up field activities at Richardson Flat Tailings were to:

pull together all responses to Comments

- o Define the surface water drainage patterns throughout the site area;
- o Verify a release of inorganic contaminants into Silver Creek;
- o Identify source material contributing to metals contamination in Silver Creek.

Dist to GW Pace?

All of the aforementioned objectives were addressed during the July 18 through July 20, 1989 sampling effort. ~~However, the exact source of metals contamination has not been verified.~~

3.0 BACKGROUND

3.1 LOCATION AND SITE DESCRIPTION

Richardson Flat Tailings lies within the northwest quarter of Section 1 and the northeast quarter of Section 2, Township 2 South, Range 4 East, Salt Lake Meridian, in Summit County, Utah. The tailings cover an area of approximately 160 acres on a topographic depression located one and one-half miles northeast of the town of Park City (Figure 1).

The mill tailings at Richardson Flat came from the Keetley Ontario Mine and other metal mining operations currently owned by United Park City Mines (UPCM). The most recent use of the area for tailings disposal was from 1975 to 1981. During that time UPCM had all its mining properties leased to either Park City Ventures or Noranda Mining, Inc. who constructed and operated milling facilities on UPCM properties. In May of 1974, the Utah Division of Health - Water Pollution Committee approved plans by Park City Ventures to construct an embankment, dikes and a diversion ditch to contain mill tailings deposited on Richardson Flat.

3.2 PREVIOUS WORK

The original FIT site investigation at Richardson Flat Tailings was conducted during the summer of 1985. One background monitoring well was installed by the FIT as part of the investigation. The background well and two existing UPCM wells located at the base of the dam were sampled. In addition, six surface water samples, one surface soil sample, two subsurface soil samples, four surface tailings samples and four subsurface tailings samples were collected during the 1985 sampling effort. Findings of the original field investigation are discussed in the Report of Sampling Activities (TDD R8-8505-27) and the Analytical Results Report (TDD R8-8508-07).

In July, 1986 the FIT conducted high-volume air sampling at the site. A report of air sampling activities (TDD R8-8605-12) and an analytical results report for air sampling (TDD R8-8608-05) provide details of field work and data results.

The FIT submitted a Hazard Ranking System (HRS) package for Richardson Flat Tailings on September 3, 1987. Based on documented observed releases of inorganic contaminants to surface water and air, the site received an overall migration score exceeding the 28.5 threshold value required for nomination to the National Priorities List (NPL). Proposal of Richardson Flat Tailings to the NPL appeared in the Federal Register on June 14, 1988.

4.0 SITE GEOLOGY, HYDROGEOLOGY AND HYDROLOGY

4.1 GEOLOGY

Richardson Flat Tailings lies within a broad, gently rolling flat north of Park City, identified as Parleys Park. Over half of the total area (approximately 35 square miles) of Parleys Park is underlain by unconsolidated deposits of a poorly sorted mixture of clay to cobble size material. The unconsolidated deposits, which are saturated to within a few feet of the ground surface, occur primarily along Silver

and East Canyon Creeks and in the flats northwest of Quarry Mountain. The rest of the park is underlain by consolidated rocks including volcanics of Tertiary origin and Knight Conglomerate (Baker 1970).

3.3.2
~~4.2~~ HYDROGEOLOGY

The water sources for wells in the Heber-Kamas-Park City area are primarily consolidated rocks in the mountains and unconsolidated alluvial fill in the valleys. Few wells exist within Parleys Park, so the unconfined aquifer characteristics in the area are not well understood. There appears to be no well-defined beds of material of very high or very low permeability, and no indications of the existence of artesian conditions. The average saturated thickness of the unconfined aquifer is broadly estimated to be about 40 feet.

The general ground water flow direction corresponds with the regional surface water flow directions. Recharge to ground water in the unconsolidated deposits in Parleys Park comes from direct infiltration of precipitation, runoff from the mountains and secondarily from subsurface inflow through consolidated rocks (Baker 1970).

3.3.2
~~4.3~~ HYDROLOGY

add Map #1 "Parley Park" show Weber & Park City

Parleys Park is drained by East Canyon Creek and Silver Creek, both tributaries to the Weber River. Silver Creek flows west of and near the northern extension of Richardson Flat Tailings, ~~which~~ and has been channelized for irrigation purposes both upstream and downstream ~~of~~ from the tailings. The nearest diversion from Silver Creek downstream of the tailings is the G.M. Pace ditch used for flood irrigation of alfalfa fields and pasture.

direction of flow

location?

A diversion ditch within the tailings ~~has been~~ was constructed in 1977 as part of the effort by Park City Ventures to contain tailings material deposited on Richardson Flat. Construction of the diversion ditch has altered the drainage pattern as depicted on the 1955 USGS topographic map (Figure 1). The diversion ditch originates east of the tailings and

part of approved plan?

terminates near the embankment at the northwest portion of the tailings. Figure 2 depicts the course of the diversion ditch as viewed on an oblique aerial photograph provided by EPA Environmental Monitoring Systems Laboratory (EMSL), dated June 1984.

Normal annual total precipitation for Richardson Flat is reported between 16 and 20 inches (Baker 1970).

4.0

~~5.0~~ SAMPLING ACTIVITIES

4~~5~~.1 SAMPLE COLLECTION

FIT sampling activities at the Richardson Flat Tailings began on Tuesday, July 18, 1989 and continued through July 20, 1989. The sampling team consisted of Kevin Mackey, project officer, Steve Yarbrough, site safety officer and Dan Kenney, sampler.

Samples collected during this effort were shipped on July 20, 1989 to the following Contract Laboratory Program (CLP) laboratories for analysis. Samples of tailings and surface water were shipped as low hazard environmental samples to Keystone Environmental Resources in Houston, Texas for total metals analysis under Regular Analytical Services case number 12334. However, due to contractual difficulties Keystone Environmental performed only mercury analysis on these samples. Under the direction of the Sample Management Office (SMO) these samples were shipped by Keystone Environmental to Silver Valley Laboratory in Kellogg, Idaho for the remainder of the analyses. Sediment samples were shipped to Silver Valley Laboratory in Kellog, Idaho under Special Analytical Service case number 4725H. These samples were sieved in an 80 mesh sieve in order to remove large gravel and organic matter prior to analysis for total metals.

4.1.3

Initially, the FIT proposed screening sediment samples using FASP XRF analysis for metal contaminant detection. However, during the sampling period the FIT XRF experienced operating problems and was not available to perform the analysis. The FIT opted to send a single

sediment sample from each sample location to the CLP laboratory for sieving and analysis.

4 5.1.1 Tailings Samples

The FIT collected a total of five tailings samples from various locations throughout the tailings impoundment, Figure 2. These samples included:

RFT-TA-1 Eastern end of tailings between access road and diversion ditch.

RFT-TA-2 Southern end of tailings pile between Union Pacific Railroad and diversion ditch.

RFT-TA-3 Southwestern edge of tailings between Union Pacific Railroad and diversion ditch.

RFT-TA-4 Flood plain tailings located ~~next to~~ on west side of Silver Creek on the western edge of Union Pacific Railroad bed.

RFT-TA-5 Downgradient-most sample along the flood plain tailings near Silver Creek.

All tailings samples were collected using a plastic scoop or a decontaminated stainless steel spoon. The FIT composited samples on a plastic sheet prior to placing them in the appropriate sample containers.

4 5.1.2 Surface Water Samples

The FIT collected 12 surface water samples during the course of this investigation. Two sample aliquots were collected at each station. One sample (designated by the station location number followed by an "A" designator) was filtered with a 0.45 micron filter and a barrel filter prior to preservation with nitric acid to a pH <2. The second aliquot

(designated by location number followed by a "B" qualifier) was preserved in the same manner without filtering. These samples were collected from Silver Creek located west of the tailings pond, and from a diversion ditch which conveys runoff around the tailings impoundment and from a marshy area located downgradient of the diversion ditch at the base of the tailings dam. The FIT collected one additional sample from the Pace Homer irrigation ditch which discharges into Silver Creek upgradient of the tailings impoundment. Sample locations are shown in Figure 2. Specifically, the samples included:

RFT-SW-1 Background sample collected from the Pace Homer Ditch.

RFT-SW-2 Sample collected from Silver Creek near the floodplain tailings.

RFT-SW-3 Additional sample collected from Silver Creek near floodplain tailings.

RFT-SW-4 Upgradient sample in runoff diversion ditch.

RFT-SW-5 Samples collected from the diversion ditch at possible point of tailings entry.

RFT-SW-6 Sample collected from point of diversion ditch discharge into marshy area.

RFT-SW-7 Sample collected from a marshy area upgradient of the confluence with Silver Creek.

RFT-SW-8 Sample collected from the point where Silver Creek enters marshy area.

RFT-SW-9 Sample collected at culvert area where Silver Creek and marshy area drain under U.S. Route 40.

RFT-SW-10 Downgradient sample collected 800 feet upstream of the G.M. Pace irrigation diversion point.

RFT-SW-16 Surface water sample collected downstream of the confluence of Pace Homer Ditch and Silver Creek.

RFT-SW-17 Background surface water sample collected approximately 20 feet upstream of the confluence of the Pace Homer ditch and Silver Creek.

Heavy construction activity upgradient of surface water sample locations RFT-SW-2 and RFT-SW-3 resulted in highly turbid water at the time of sampling. The turbidity in the surface water was caused by heavy machinery moving through Silver Creek and disturbing streambed material. The additional suspended sediment could result in elevated metals concentrations in the unfiltered aliquots of samples collected from these locations.

5.1.3 Sediment Sample Collection

The FIT collected sediment samples in conjunction with each surface water sample. Each sediment sample was collected immediately following surface water sample collection. Each sample was collected using a plastic scoop or a decontaminated stainless steel spoon. The FIT composited each sediment sample on a plastic sheet prior to placing the sample in the appropriate sample container.

5.1.4 Opportunity Samples

After performing a site reconnaissance the FIT selected two locations for opportunity sample collection. Additional surface water samples (RFT-OPW-1A and RFT-OPW-1B) and a sediment sample (RFT-OSE-1) were collected from a ponded seep area at the base of the tailings dam. A second opportunity sediment sample (RFT-OSE-2) was collected from a small seep area located approximately 50 feet northeast of the ponded seep area, along the face of the tailings dam (Figure 2). Flow in this

seep area was insufficient for surface water sample collection. Surface water sample RFT-OPW-1A was filtered prior to preservation with nitric acid to a pH <2.

5.0 QUALITY CONTROL

The FIT closely adhered to quality control procedures during the sampling activity as described in the Sampling Plan and in SOP III-2, Chapter 6.

5.1 ~~5.2.1~~ Instrument Calibration

Instruments utilized on this SI were calibrated by FIT members in the field. An Orion pH meter and a specific conductivity meter were calibrated daily and used at each surface water sample collection point. In addition, pH paper was used to determine tailings and sediment pH at each sample location. All pH, temperature and specific conductance data can be seen in Tables 2 and 3 of this report. Daily instrument calibrations can be found in the Richardson Flat logbook (TDD F08-8903-06).

5.2 ~~5.2.2~~ Sample Containers

All sample containers were obtained though the Sample Management Office (SMO) Bottle Repository. A rinsate blank was collected for each day of sampling and submitted to the Contract Laboratory Program (CLP) laboratory to assess quality control (quality assurance on equipment decontamination and field handling).

5.3 ~~5.2.3~~ Background Samples

The FIT collected background samples for both the Silver Creek and diversion ditch drainage. Upgradient surface water and sediment samples RFT-SW-1A, RFT-SW-1B and RFT-SE-1 were collected from the Pace Homer Ditch (an irrigation ditch which discharges into Silver Creek upgradient of the floodplain tailings area). Additional surface water and sediment

samples RFT-SW/SE-16 and RFT-SW/SE-17 were collected on Silver Creek upgradient of the floodplain tailings. Samples RFT-SW/SE-16 and RFT-SW/SE-17 were collected downgradient and upgradient of the confluence of the irrigation ditch with Silver Creek, respectively.

An upgradient surface water and sediment sample (RFT-SW/SE-4) was collected from the eastern end of the runoff diversion ditch which conveys runoff from the surrounding hills near the tailings pond (Figure 2).

5.4
~~5.2.4~~ Blank Samples

The FIT prepared a total of three blanks for this sampling effort. RFT-SW-12A, RFT-SW-12B, RFT-SW-15A, RFT-SW-15B, RFT-SW-18A and RFT-SW-18B were field rinsate blanks (prepared to check decontamination of sampling equipment).

5.5
~~5.2.5~~ Duplicate Samples

Samples RFT-SW-11A and RFT-SW-11B were collected as a duplicate of RFT-SW-2A and RFT-SW-2B. These samples provide verification of laboratory accuracy.

5.6
~~5.2.6~~ Decontamination Procedures

The FIT followed decontamination procedures as set forth in SOP III-2, Chapter 11 Equipment Decontamination Procedures. This procedure involved the following steps: a tap water wash, soapy water wash, triple deionized water rinse and air drying.

5.7
~~5.3~~ DOCUMENTATION

Following sample collection, all samples were handled in strict accordance with chain of custody protocol prescribed by the NEIC Procedures Manual for the Evidence Audit of Enforcement Investigation by Contractor Evidence Audit Teams, April 1984 (EPA-330/9-81-003R). Table

1 of this report includes the sample identification numbers, sample tag numbers, traffic report numbers and chain of custody number. Copies of traffic reports, chain of custody records and pertinent airbills are available in TDD file F08-8903-06. The Richardson Flat logbook has a complete record of all documentation information (TDD F08-8903-06).

6.0 ~~FIELD OBSERVATIONS~~ RESULTS / FINDINGS

The FIT spent three days collecting samples from the tailings and runoff features at the Richardson Flat Tailings facility. Weather conditions were favorable with no appreciable precipitation occurring during the sampling effort.

Start w/

Surface water samples RFT-SW-2 and RFT-SW-3 collected from Silver Creek were highly turbid due to heavy construction occurring approximately 200 feet upstream of the sample locations. All field observations for this sampling effort are recorded in the Richardson Flat logbook (TDD F08-8903-06).

FIT sampling activities were observed by UPCM personnel Kerry Gee and Ed Osika and consultant Bill Bullock of MSE (an environmental consulting firm from Butte, Montana). The FIT provided split samples to UPCM personnel for each sample FIT collected. Each split was treated in an identical manner to those samples FIT submitted for CLP analysis.

Samples were collected in a manner which took into account drainage patterns throughout the Richardson Flat area. The FIT collected samples in order to assess possible migration of contaminants offsite into Silver Creek and determine the presence of contaminants in these drainage areas. Additional samples were taken from two possible seep locations at the base of the tailings dam in order to assess the likelihood of contaminant migration via seeps and springs from the tailings pond area.

Two additional tailings samples were collected from the "flood plain tailings" located along Silver Creek adjacent to the Richardson

finding

Flat site. There is no containment feature associated with these areas and the tailings material could easily be washed into Silver Creek during storm events. According to plat maps obtained from the Summit County Assessor's office, these floodplain tailings are on land which is currently owned by the U.S. Department of Transportation.

4.9

The FIT collected samples from the diversion ditch around the tailings pile. These samples were taken in such a manner as to determine availability of contaminated material for transport offsite via the diversion ditch structure. In addition, these samples will help the FIT assess the integrity of runoff control structures onsite.

4.7

7.0 QUALITY ASSURANCE REVIEW

move to 5.08

The inorganic data packages were examined thoroughly by FIT chemists for compliance using EPA Functional Guidelines for Reviewing Inorganic Data and the approved Region VIII FIT CLP Quality Assurance Standard Operating Procedures (SOP). The quality assurance reports and data sheets are attached as Appendix C. The data packages were judged acceptable overall, with qualifications as follows.

7.1 SEDIMENT SAMPLES

Spike recoveries were low for antimony and thallium indicating positive results for these elements are biased low and are flagged "j", estimated. Selenium recoveries were unacceptably low and positive values are flagged "j" and undetected values are rejected, "r". Thallium and selenium data were also flagged "j" for below criteria correlation in method of standard additions. Cadmium data were flagged "j", estimated, due to percent difference in serial dilution results.

7.2 WATER AND TAILINGS SAMPLES

Samples were transferred from one CLP laboratory to another by the Sample Management Office. Mercury results are flagged "j" estimated because of missed holding times. Recoveries for thallium and selenium

were low and were flagged as described above. Lead results were flagged "j" due to duplicate results. Arsenic data were flagged "j", estimated data, due to poor correlation coefficients for MHP 517, MHP 518 and MHP 504. Arsenic and zinc solid sample results were flagged "j" due to high serial dilution results. Field duplicates showed good relative agreement. Field blanks were free of contamination above contract detection limits except that arsenic in RFT-SW-12B was detected at 12 µg/l.

8.0 ANALYTICAL RESULTS

Incorporate in Chap 6.

The results of the inorganic analysis are shown in Tables 3,4 and 5. The sampling locations and the concentrations of arsenic and lead at each sample location are depicted in Figures 3 through 5. Each figure gives relative concentrations of contaminants for each medium sampled (i.e. Figure 3 contains lead and arsenic concentrations for tailings samples. Figure 4 contains lead and arsenic concentrations for surface water samples. Figure 5 contains lead and arsenic concentrations for sediment samples).

The following is a discussion of analytical results for each medium sampled.

8.1 TAILINGS SAMPLES

Samples collected from the Richardson Flat tailings pond showed fairly constant concentrations of lead and arsenic. In particular, arsenic concentrations in tailings samples were relatively constant at approximately 200 mg/kg while lead concentrations were slightly more variable (ranging from 2580 mg/kg to 4520 mg/kg). These samples were collected from an area immediately south of the tailings pond diversion ditch. There was no effective barrier to erosional transport of this material into the diversion ditch. Contaminants detected in this material could potentially be transported via the diversion ditch into the Silver Creek drainage.

Samples collected from the floodplain tailings (RFT-TA-4 and RFT-TA-5) exhibited a higher degree of variability. Arsenic concentrations in sample RFT-TA-4 were 859 mg/kg while sample RFT-TA-5 had an arsenic concentration of 175 mg/kg. Lead concentrations were also highly variable with sample RFT-TA-5 having a lead concentration of 31,600 mg/kg while RFT-TA-4 had a concentration of 9300 mg/kg. These tailings were also susceptible to erosional transport into Silver Creek with no visible containment structure present.

8.2 SURFACE WATER SAMPLES

Analysis of surface water samples collected from Silver Creek showed significant levels of lead, arsenic and mercury. Specifically, these contaminants were detected at largest concentration in samples collected near the floodplain tailings area (RFT-SW-2B, RFT-SW-3B) and in samples collected from the upper reaches of the Richardson Flat diversion ditch (RFT-SW-4B). Elevated arsenic and lead levels in samples RFT-SW-2B and RFT-SW-3B may be due to turbidity generated by heavy construction activities upsream on Silver Creek. In all cases, the unfiltered surface water samples showed much higher concentrations of arsenic, lead and mercury than the filtered samples (samples with an "A" designation).

Arsenic, lead and zinc levels were also higher in opportunity sample RFT-OPW-1B. The FIT collected this sample from a seep area at the base of the tailings pond. Arsenic concentrations in RFT-OPW-1B were 33.1 µg/l while lead and zinc concentrations were 68.2 µg/l and 759 µg/l, respectively. Mercury was not detected in significant quantities in this seep sample.

Contaminant concentrations in opportunity sample RFT-OPW-1B suggest a slight contribution to surface water contamination from the Richardson Flat Tailings area. However, a higher level of contamination was detected in Silver Creek samples (RFT-SW-2B and RFT-SW-3B). Surface water sample RFT-SW-2B had arsenic concentrations of 619 µg/l, lead 20,000 µg/l, mercury 11.50 µg/l and zinc 19,300 µg/l significantly

elevated above concentrations in background samples RFT-SW-1A and B, RFT-SW-16A and B and RFT-SW-17A and B. Sample RFT-SW-3B had elevated concentrations of arsenic 41.9 µg/l, lead 1100 µg/l and zinc 3790 µg/l, while mercury was not detected. Based on these concentrations the floodplain tailings and additional upgradient sources appear to be contributing arsenic, lead, mercury and zinc to the Silver Creek drainage.

At each sample location, the unfiltered surface water samples showed higher levels of contamination indicating that a majority of the contaminants were suspended in solution. The filtered and the unfiltered surface water samples exhibit a similar trend in relative contaminant magnitudes and in the contaminants detected. Downgradient concentrations of lead, arsenic and mercury are elevated above those detected in background samples for the filtered samples.

8.3 SEDIMENT SAMPLES

Analysis of sediment samples collected from Silver Creek, the marshy area and the storm runoff diversion ditch around the tailings pond indicated significant levels of arsenic, cadmium, lead, mercury and zinc contamination in the area. The discussion focuses on arsenic since the other contaminants correlate with arsenic.

The background sediment sample collected from Silver Creek above the Pace Homer ditch confluence (RFT-SE-17) had a concentration of 555 mg/kg of arsenic. However, immediately downstream of the confluence, sample RFT-SE-16 had a lower arsenic concentrations 211 mg/kg. Meanwhile sample RFT-SE-1 collected from the Pace Homer ditch above the confluence of Silver Creek showed an 83.2 mg/kg concentration of arsenic. These concentrations indicate an additional source of contamination upstream of the Richardson Flat tailings dam and the floodplain tailings.

Samples RFT-SE-2 and RFT-SE-3 were collected from Silver Creek near the floodplain tailings and upstream of the convergence with the marsh

area at the base of the tailings pond. These samples exhibited arsenic concentrations of 570 mg/kg and 427 mg/kg, respectively. However, these relatively large concentrations are not three times the levels detected in background samples RFT-SE-16 and RFT-SE-17. These sediments contained arsenic and lead at concentrations greater than the floodplain tailings.

Samples collected from the marsh area also showed significant concentrations of arsenic. Those sediment samples collected from the marsh area confluence with Silver Creek (RFT-SE-8 and RFT-SE-9) exhibited higher arsenic concentrations than those samples collected from the area where the diversion ditch discharges into the marsh (RFT-SE-6 and RFT-SE-7 in Figure 2). Again, arsenic values were not three times greater than those detected in the background samples.

Arsenic concentrations in the diversion ditch samples (RFT-SE-4, RFT-SE-5 and RFT-SE-6) actually decreased in a downgradient manner across the tailings pile. The highest concentration of arsenic in the diversion ditch was detected in upgradient sample RFT-SE-4, 776 mg/kg and consistently decreased in the more downgradient samples (RFT-SE-5 at 320 mg/kg and RFT-SE-6 at 261 mg/kg). These samples were collected from areas with little hydraulic gradient, low flow and without a well-defined channel. Heavy marsh vegetation was present. Samples RFT-SE-5 and RFT-SE-6 contained a large amount of decaying organic matter which may have decreased arsenic concentration.

Downgradient sediment sample RFT-SE-10 was collected 800 feet upgradient of an irrigation diversion structure on Silver Creek. This sample exhibited a low arsenic concentration, 5.4 mg/kg, suggesting a significant decrease in arsenic levels within 600 feet of RFT-SE-9, collected from the marsh, which showed much higher contamination.

The result of these analyses indicate that a majority of the elevated arsenic concentrations may be the result of contribution from additional tailings located upgradient along Silver Creek. This

occurrence indicates additional sources other than the tailings stored in the Richardson Flat tailings pond.

8.4 OPPORTUNITY SAMPLES

After careful reconnaissance of the tailings dam and the surrounding area the FIT discovered two locations which warranted additional sampling.

Samples RFT-OPW/OSE-1 and RFT-OSE-2 were collected from seep areas at the base of the tailings dam. Opportunity sediment sample RFT-OSE-1 was collected from a ponded area at the base of the tailings dam and showed elevated lead (12,500 mg/kg) and arsenic (751 mg/kg). Sediment sample RFT-OSE-2 was collected from a seep area located approximately 50 feet north of the pond area where opportunity sample RFT-OSE-1 was collected. Flow from this seep was minimal and the FIT was not able to collect a water sample. Sediment sample, RFT-OSE-2 contained the highest overall arsenic concentrations, 839 mg/kg. However, lead concentrations in RFT-OSE-2 were roughly half of those detected in RFT-OSE-1 (6900 mg/kg). These arsenic and lead concentrations exceed those found in the surface tailings samples from the Richardson Flat.

These concentrations indicate a possible loss of integrity in the tailings dam control structure. The presence of these contaminants in seep samples may indicate a contribution of contamination to Silver Creek from the tailings pond area.

9.0 SUMMARY AND CONCLUSIONS

Results ? → Chap 6

After a systematic sampling effort, the FIT detected a number of inorganic contaminants present in tailings, surface water and sediment samples collected from the Silver Creek and Richardson Flat tailings area. The surface water results are more subject to transitory changes due to turbidity than are the sediment results, although they show the same trends.

RESULTS

Arsenic, lead and mercury were detected in most of the samples. The highest concentrations of lead and arsenic were detected in upgradient samples RFT-SE-17 (555 mg/kg arsenic and 12,200 mg/kg lead) and RFT-SE-4 (776 mg/kg arsenic and 13,600 mg/kg lead). Sediment concentrations of arsenic and lead are fairly constant from upgradient sample RFT-SE-17 downstream along Silver Creek to downgradient sample RFT-SE-10. Arsenic levels range from 211 mg/kg in sample RFT-SE-16 to 590 mg/kg in sample RFT-SE-2.

Arsenic and lead concentrations may actually be fairly constant throughout the Silver Creek drainage studied in this investigation with variations in sample results possibly due to non-homogenous depositional variations in contaminated sediment material. Contribution of contaminants by the floodplain tailings that were sampled is not well understood.

Samples collected from the Richardson Flat run-off diversion ditch also showed elevated lead and arsenic contamination. However, concentrations of both compounds decrease consistently in downgradient samples. Sample RFT-SE-4, collected from the eastern upgradient end of the diversion ditch, has roughly twice the arsenic concentrations as those detected in downgradient diversion ditch samples. This may be due to the large amount of decaying organic matter present in the downgradient samples.

Samples collected from sediment in Silver Creek indicate additional sources of contamination upstream of the Richardson Flat tailings dam. However, seep and sediment samples collected from the face of the tailings dam and sediment samples collected from the diversion ditch indicate some contribution from the tailings area.

In general, the weight of the evidence indicates a substantial contaminant contribution to Silver Creek by sources upgradient of the Richardson Flat tailings area. Additional contamination is migrating from the Richardson Flat tailings area and could also be affecting water quality in the Silver Creek drainage.

10.0 REFERENCES

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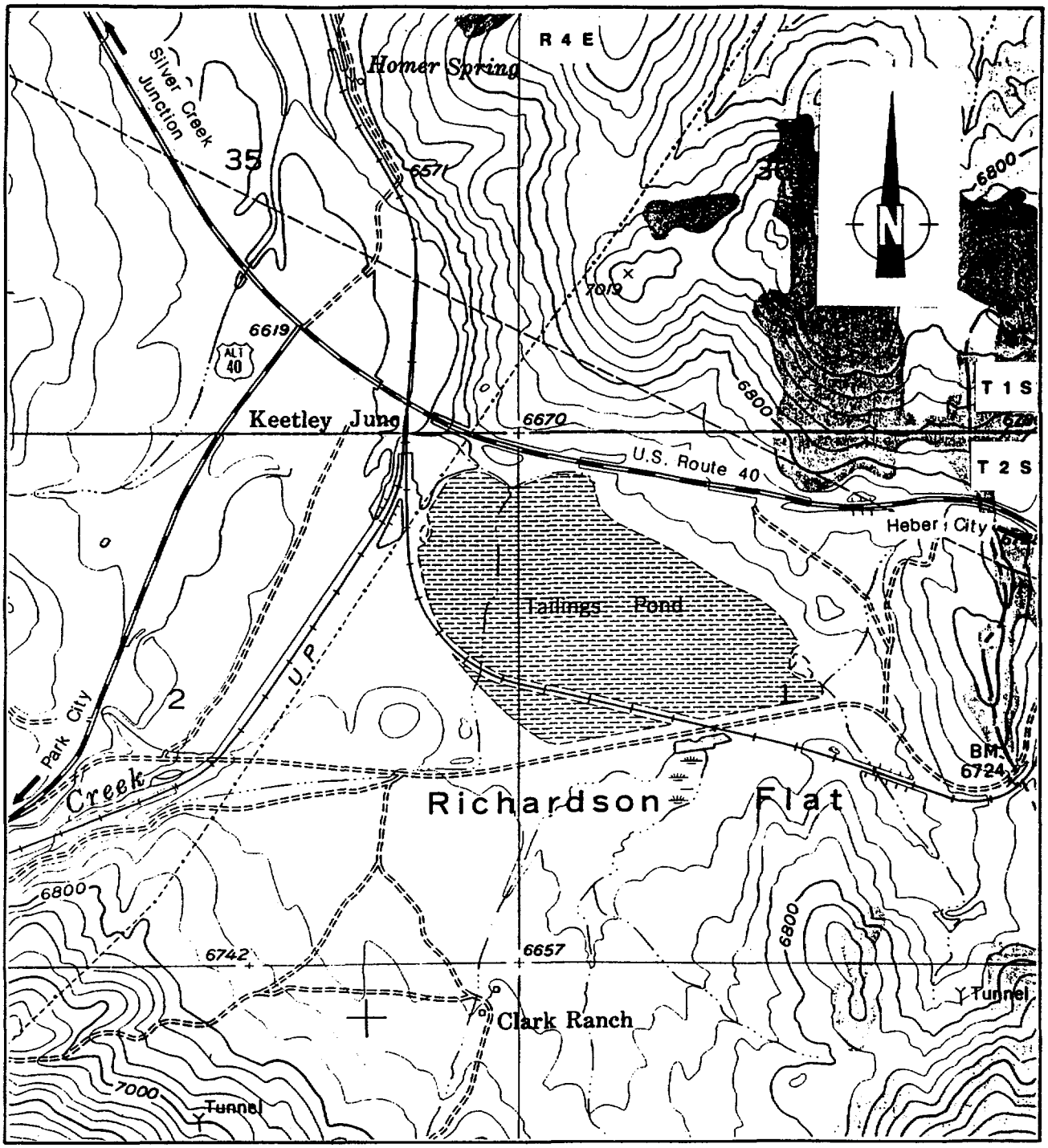
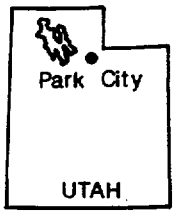


Source: Park City Quadrangle, Utah. USGS, 1955

0 1/2 1 Mile

LOCATION MAP



FIELD INVESTIGATIONS OF UNCONTROLLED HAZARDOUS WASTE SITES
TASK REPORT TO THE E.P.A.

TITLE:

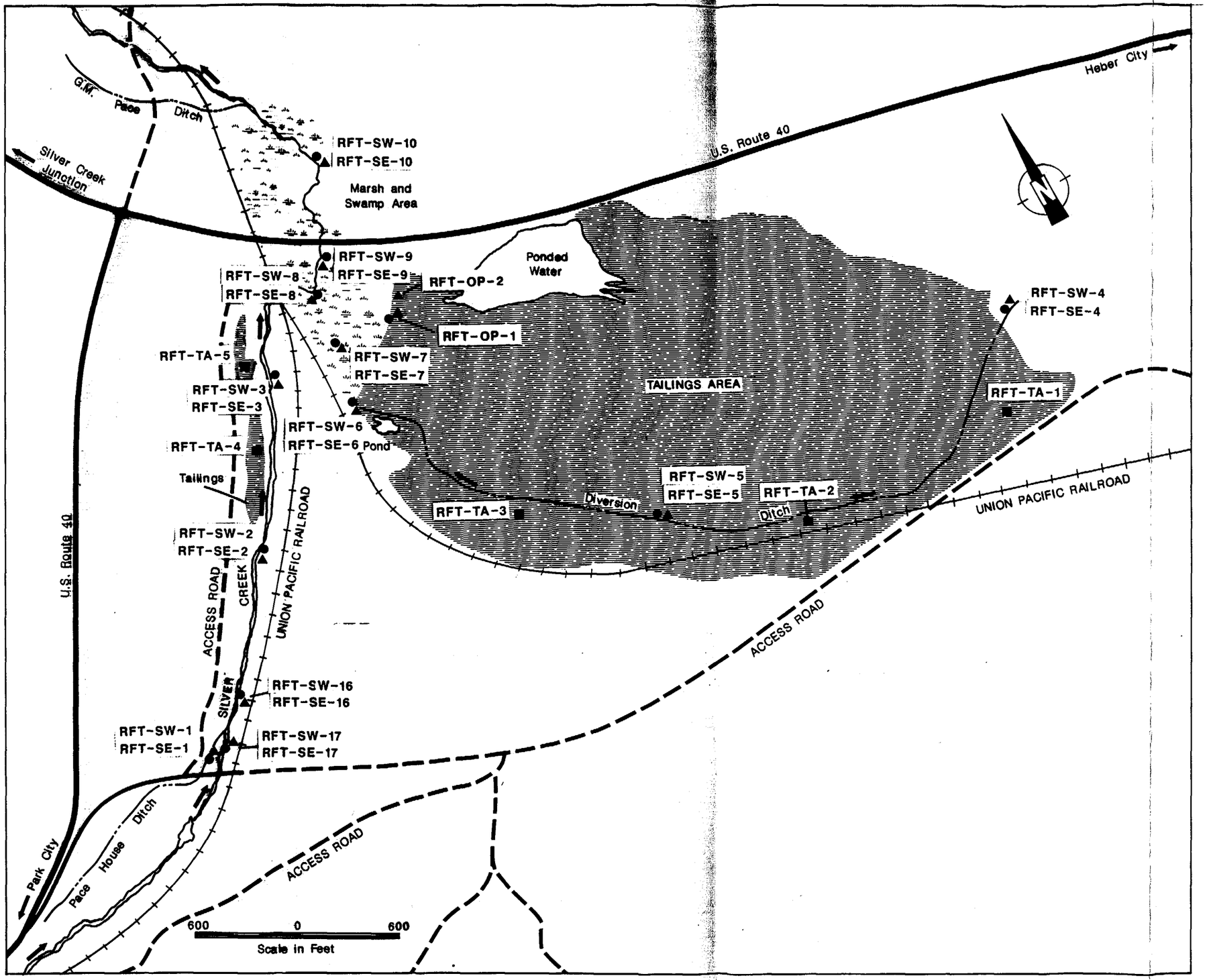
RICHARDSON FLAT TAILINGS
Park City, Utah
SITE LOCATION MAP

T.O.D. F08-8903-06

ecology & environment, inc.
DENVER, COLORADO

FIG. 1

Date: 06/89 Drawn by: RSM Scale: _____



FIELD INVESTIGATIONS OF UNCONTROLLED HAZARDOUS WASTE SITES
TASK REPORT TO THE E.P.A.

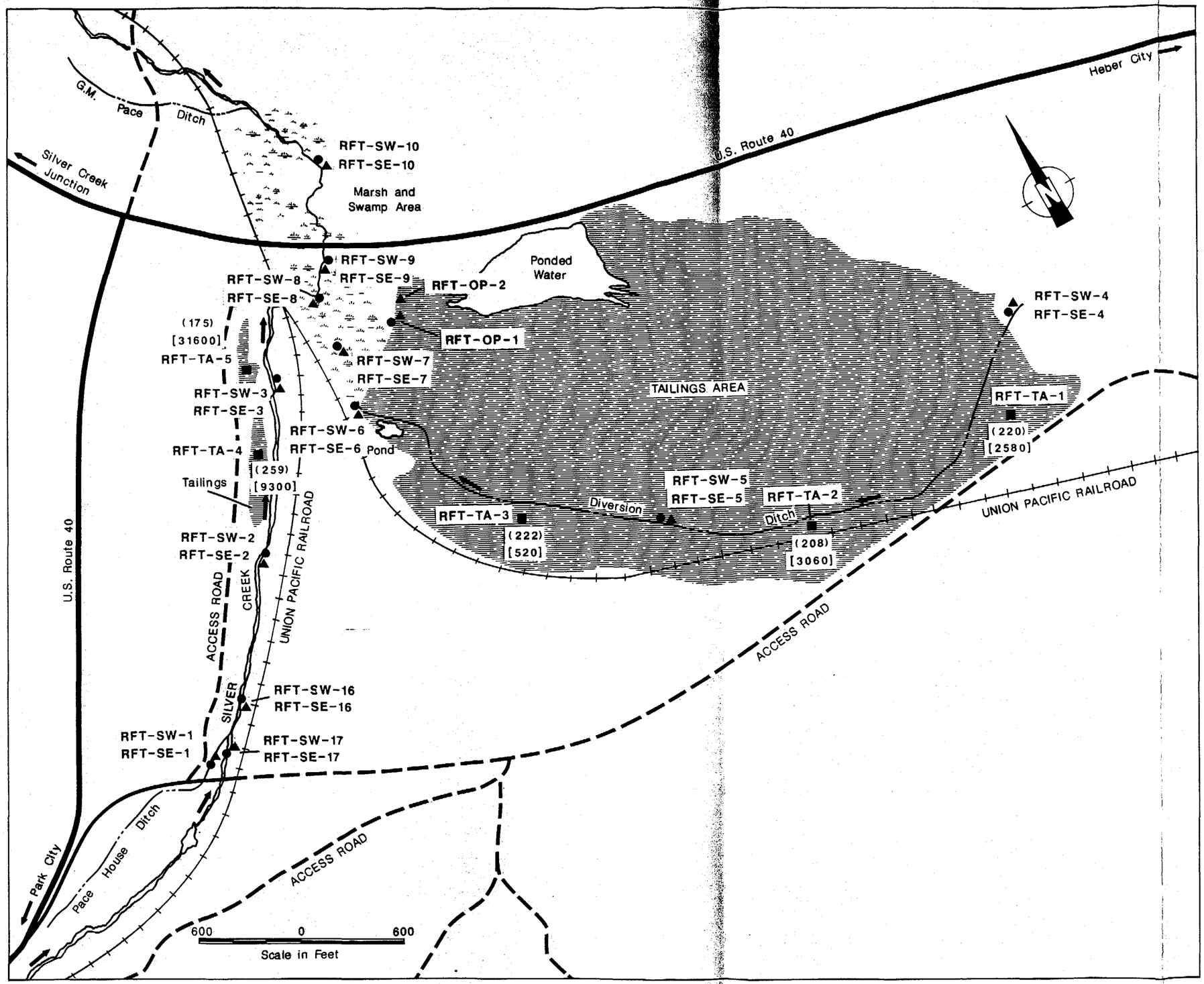
TITLE:
RICHARDSON FLAT TAILINGS
Park City, Utah
SAMPLE LOCATION MAP

T.D.D. F08-8903-06

ecology & environment, inc.
DENVER, COLORADO

FIG. 2

Date: 08/89 Drawn by: RSM Scale: _____



LEGEND

- ■ Tailings sample
- ● Surface water sample
- ▲ Sediment sample
- **(259)** Arsenic concentration (mg/kg)
- **[31600]** Lead concetration (mg/kg)

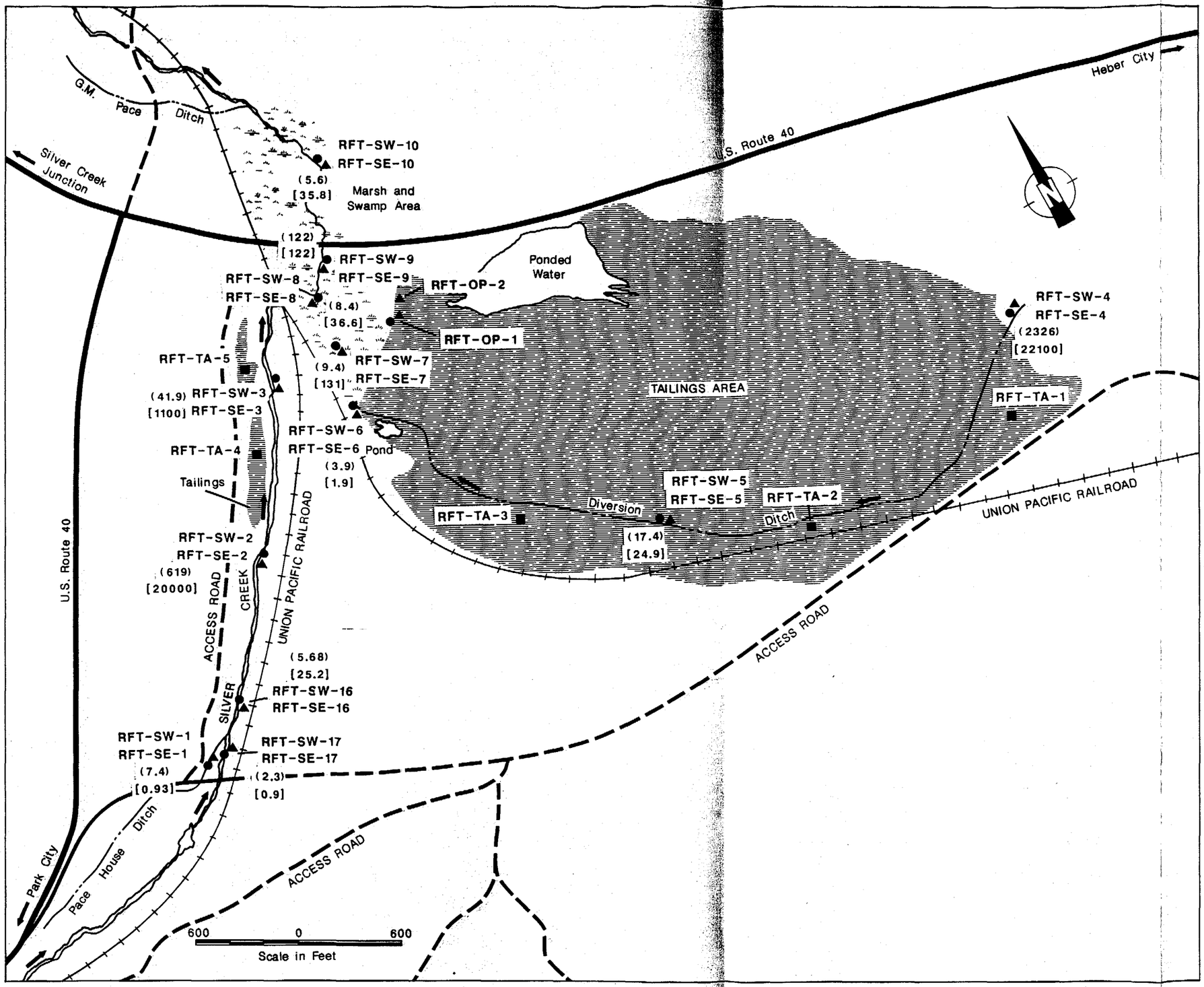
FIELD INVESTIGATIONS OF UNCONTROLLED HAZARDOUS WASTE SITES
TASK REPORT TO THE E.P.A.

TITLE:
RICHARDSON FLAT TAILINGS
Park City, Utah
CONCENTRATION OF LEAD AND ARSENIC IN TAILINGS SAMPLES
T.O.D. F08-8903-06

ecology & environment, inc.
DENVER, COLORADO

FIG. 3

Date: 08/89 Drawn by: RSM Scale: _____



LEGEND

- ■ Tailings sample
- ● Surface water sample
- ▲ Sediment sample
- [20000] Lead concentration (ug/l)
- (619) Arsenic concentraton (ug/l)

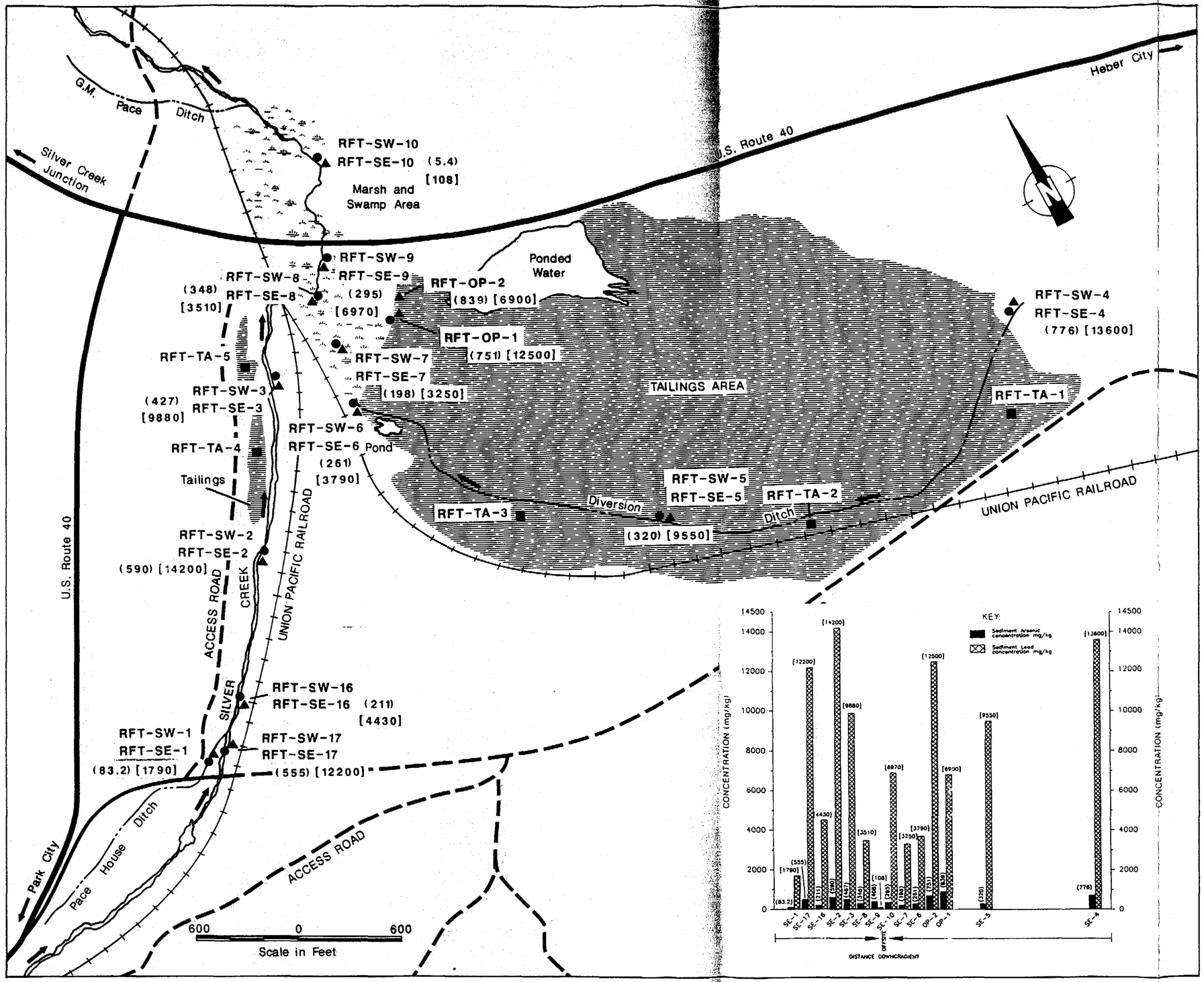
FIELD INVESTIGATIONS OF UNCONTROLLED HAZARDOUS WASTE SITES
TASK REPORT TO THE E.P.A.

TITLE:
RICHARDSON FLAT TAILINGS
Park City, Utah
CONCENTRATIONS OF LEAD AND ARSENIC IN UNFILTERED WATER SAMPLES (ug/l)
T.D.D. F08-8903-06

ecology & environment, inc.
DENVER, COLORADO

FIG. 4

Date: 08/89 Drawn by: RSM Scale: _____



LEGEND

- ■ Tailings sample
- ● Surface water sample
- ▲ Sediment sample
- (839) Sediment Arsenic concentrations mg/kg
- [14200] Sediment Lead concentrations mg/kg

FIELD INVESTIGATIONS OF UNCONTROLLED HAZARDOUS WASTE SITES
TASK REPORT TO THE E.P.A.

TITLE:
RICHARDSON FLAT TAILINGS
Park City, Utah
SEDIMENT ARSENIC AND LEAD CONCENTRATION MAP

T.D.D. F08-8903-06

ecology & environment, inc.
DENVER, COLORADO

FIG. 5

Date: 08/89 Drawn by: RSM Scale:

TABLE 1 SURFACE WATER FIELD DATA SITE: Richardson Flat Tailings

SAMPLE ID.	SAMPLING		SHIPPING DATE	FIELD DATA			COMMENTS
	DATE	TIME		pH	COND. umho	TEMP. C	
RFT-SW-1A & B	07/19/89	1107	07/20/89	7.5	620	20	
RFT-SW-2A & B	07/19/89	1040	07/20/89	7.3	1300	19	These samples were collected in Silver Creek downstream of construction activities. These activities resulted in highly turbid water which, in turn, may increase metals concentrations in unfiltered surface water samples RFT-SW-2B and RFT-SW-3B.
RFT-SW-3A & B	07/19/89	1016	07/20/89	7.5	1350	18	
RFT-SW-4A & B	07/19/89	0911	07/20/89	7.05	1000	14	
RFT-SW-5A & B	07/19/89	0854	07/20/89	7.09	1300	14	
RFT-SW-6A & B	07/19/89	0824	07/20/89	6.8	1600	17	
RFT-SW-7A & B	07/18/89	1648	07/20/89	6.01	1500	20	
RFT-SW-8A & B	07/18/89	1633	07/20/89	6.61	1500	19	
RFT-SW-9A & B	07/18/89	1345	07/20/89	7.74	1200	24	
RFT-SW-10A & B	07/18/89	1511	07/20/89	8.08	1200	22	
RFT-OPW-1A & B	07/19/89	1345	07/20/89	7.51	1200	17	

TABLE 1 (Cont) SURFACE WATER FIELD DATA SITE: Richardson Flat Tailings

SAMPLE ID.	SAMPLING		SHIPPING DATE	FIELD DATA			COMMENTS
	DATE	TIME		pH	COND. umho	TEMP. C	
RFT-SW-11A & B	07/19/89	1040	07/20/89	7.3	1300	19	Duplicate of RFT-SW-2A & B
RFT-SW-15A & B	07/19/89	1437	07/20/89	--	--	--	Blank
RFT-SW-16A & B	07/20/89	1025	07/20/89	7.15	1000	16	
RFT-SW-17A & B	07/20/89	1040	07/20/89	7.0	1000	16	
RFT-SW-18A & B	07/20/89	1100	07/20/89	--	--	--	Blank

TABLE 2 SOIL AND SEDIMENT FIELD DATA SITE Richardson Flat Tailings

SAMPLE ID	SAMPLING		SHIPPING DATE	COMMENTS
	DATE	TIME		
RFT-SE-1	07/19/89	1107	07/20/89	Dark brown material, some organic matter present
RFT-SE-2	07/19/89	1040	07/20/89	Light gray medium to fine grained sediment
RFT-SE-3	07/19/89	1016	07/20/89	Light gray medium to fine grained sediment
RFT-SE-4	07/19/89	0925	07/20/89	Dark brown to medium gray, fine grained sediment
RFT-SE-5	07/19/89	0900	07/20/89	Gray with rust color
RFT-SE-6	07/19/89	0835	07/20/89	Light gray, medium to coarse grained sediment
RFT-SE-7	07/18/89	1700	07/20/89	Dark brown sediment high in organic matter
RFT-SE-8	07/18/89	1640	07/20/89	Dark brown sediment high in organic matter
RFT-SE-9	07/18/89	1351	07/20/89	Medium gray fine grained sediment, some organic matter present
RFT-SE-10	07/18/89	1524	07/20/89	Dark brown silty clay (fine grained)
RFT-SE-16	07/20/89	1025	07/20/89	Medium gray, fine to coarse grained sediment
RFT-SE-17	07/20/89	1040	07/20/89	Medium gray, fine to coarse grained sediments
RFT-TA-1	07/18/89	1115	07/20/89	Tan or rust colored, fine sand or tailings
RFT-TA-2	07/18/89	1125	07/20/89	Tan colored, fine sand or tailings

TABLE 2 SOIL AND SEDIMENT FIELD DATA SITE Richardson Flat Tailings

SAMPLE ID	SAMPLING		SHIPPING DATE	COMMENTS
	DATE	TIME		
RFT-TA-3	07/18/89	1138	07/20/89	Light tan to gray material, fine texture
RFT-TA-4	07/18/89	1205	07/20/89	Soil pH measurements showed a pH of 2 for these tailings
RFT-TA-5	07/18/89	1217	07/20/89	Soil pH measurements showed a pH of 2

TABLE 3
INORGANIC ANALYTICAL RESULTS FOR
TAILINGS SAMPLES (mg/kg)
RICHARDSON FLAT TAILINGS
SUMMIT COUNTY, UTAH
TDD F08-8903-06 - PAN FUT0039HDA

SAMPLE #	RFT-TA-1	RFT-TA-2	RFT-TA-3	RFT-TA-4	RFT-TA-5
TRAFFIC RPT #	MHL-955	MHL-956	MHP-500	MHP-501	MHP-502
SAMPLE LOCATION	EAST OF TAILINGS POND	MIDDLE OF TAILINGS POND	WEST OF TAILINGS POND	FLOOD PLAIN TAILINGS	FLOOD PLAIN TAILINGS
Aluminum	691	1040	1530	1030	240
Antimony	63.1	84.4	87.0	120	144
Arsenic	220j	208j	222j	259j	175j
Barium	153	86.9	[32.8]	117	[39.5]
Beryllium	0.22u	0.22u	0.22u	0.27u	0.23u
Cadmium	21.1	41.2	95.9	117	250
Calcium	37000	54500	68200	5400	32800
Chromium	[2.0]	6.0	8.8	0.69u	0.59u
Cobalt	[5.5]	[2.6]	[7.4]	[3.9]	[3.2]
Copper	149	205	336	281	265
Iron	44700	36500	53400	97400	87000
Lead	2580	3060	4520	9300	31600
Magnesium	11200	18500	23000	[1140]	[142]
Manganese	1440	1740	2320	212	252
Mercury *	0.99	1.3	.88	8.20	7.60
Nickel	8.2	9.4	[7.1]	[5.1]	[6.2]
Potassium	[255]	[496]	[827]	[1140]	[680]
Selenium	23.6	12.7	19.2	45.7	38.4
Silver	12.6	18.5	22.1	62.8	115
Sodium	[22.4]	[34.8]	[42.6]	[603]	[117]
Thallium	6.6j	3.0j	[4.2]j	[9.7]j	[6.8]j
Vanadium	[1.3]	[3.8]	[3.7]	[2.6]	0.57u
Zinc	3220	5710	14100	16200	33800

* - Results have been provided by Keystone Laboratory of Houston, Texas. The remaining results are from analyses conducted by Silver Valley Laboratories of Kellog, Idaho.

j - The associated numerical value is an estimated quantity because the amount detected is below the contract required detection limit (CRDL) or because minor quality control criteria were not met. Presence of the material is reliable.

u - The material was analyzed for, but was not detected. The associated numerical value is the estimated sample quantitation limit or CRDL.

[] - The associated numerical value is an estimated quantity because the amount detected is below the contract required detection limit (CRDL). Presence of the material is reliable. (Inorganic data only).

TABLE 4
INORGANIC ANALYTICAL RESULTS FOR
SEDIMENT SAMPLES
RICHARDSON FLAT TAILINGS
SUMMIT COUNTY, UTAH
TDD F08-8903-06 - PAN FUT0039HDA

SAMPLE #	RFT-SE-1	RFT-SE-2	RFT-SE-3	RFT-SE-4	RFT-SE-5
PACKING LIST #	4725H-01	4725H-02	4725H-03	4725H-04	4725H-05
SAMPLE LOCATION	BCKGRND IRRIG DITCH	SILVER CRK NEXT TO FLOOD PLAIN	SILVER CRK DNGRDNT FLOOD PLAIN	UPGRDNT DIVERSION DITCH	DIVERSION DITCH
Aluminum	18400	8620	7650	25100	2810
Antimony	19.8j	201j	114j	200j	178j
Arsenic	83.2	590	427	776	320
Barium	270	147	130	1220	134
Beryllium	1.7	[.86]	[.81]	[1.9]	[.47]
Cadmium	14.6j	91.4j	82.0j	100j	149j
Calcium	15000	25600	2610	82100	89700
Chromium	21.9	.77u	[1.0]	33.2	10.9
Cobalt	[11.4]	43.5	38.5	[10.1]	[5.3]
Copper	239	753	459	840	613
Iron	30800	181000	148000	58600	44800
Lead	1790	14200	9880	13600	9550
Magnesium	6130	9430	8480	33800	19700
Manganese	1260	1730	1630	2770	3090
Mercury	1.0	4.9	6.0	5.5	1.5
Nickel	23.5	21.5	28.8	27.0	[2.9]
Potassium	3160	[1160]	[1150]	6270	[794]
Selenium	3.1j	46.2j	42.7j	15.4j	16.1jr
Silver	9.7	47.5	30.3	86.0	60.9
Sodium	[239]	[181]	[173]	[447]	[84.6]
Thallium	[.81]j	[3.6]j	4.1j	23.2j	12.7j
Vanadium	48.7	19.0	21.2	46.5	[8.6]
Zinc	2770	15500	15100	15700	26400

j - The associated numerical value is an estimated quantity because the amount detected is below the contract required detection limit (CRDL) or because minor quality control criteria were not met. Presence of the material is reliable.

r - Quality control indicates that data is not usable (material may or may not be present). **DO NOT USE THIS DATA!.**

u - The material was analyzed for, but was not detected. The associated numerical value is the estimated sample quantitation limit or CRDL.

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TABLE 4 CONT.
INORGANIC ANALYTICAL RESULTS FOR
SEDIMENT SAMPLES (mg/kg)
RICHARDSON FLAT TAILINGS
SUMMIT COUNTY, UTAH
TDD F08-8903-06 - PAN FUT0039HDA

SAMPLE #	RFT-SE-6	RFT-SE-7	RFT-SE-8	RFT-SE-9	RFT-SE-10
PACKING LIST #	4725H-06	4725H-07	4725H-08	4725H-09	4725H-10
SAMPLE LOCATION	OUT FLOW POINT FOR DIVERSION DITCH	MARSH	SILVER CRK DRAINAGE IN MARSH AREA	CULVERT DRAINAGE MARSH AREA	DNGRDNT 800' UPSTRM OF IRRIG DITCH
Aluminum	11100	9710	14000	10900	20200
Antimony	40.8	37.6j	80.5j	107j	10.1uj
Arsenic	261j	198	348	295	5.4
Barium	944	384	286	229	408
Beryllium	[.85]	[1.1]	[1.5]	[1.4]	1.6
Cadmium	62.3j	102j	82.3j	90.2j	2.2j
Calcium	46900	90700	85800	38700	9640
Chromium	.71u	9.9	16.5	16.3	18.5
Cobalt	64.4	20.4	33.3	20.1	[10.9]
Copper	256	264	567	498	40.7
Iron	41400	64900	49200	68700	25500
Lead	3790	3250	3510	6970	108
Magnesium	13300	20700	18400	11100	6360
Manganese	207000	19100	14300	3070	303
Mercury	0.24	0.82	1.1	5.0	[.10]
Nickel	69.7	14.0	25.8	16.3	17.0
Potassium	1870	1880	2400	1590	6050
Selenium	5.6j	9.2j	13.2j	21.9j	5.6ur
Silver	13.7	23.9	36.9	36.2	.41u
Sodium	[344]	[254]	[276]	[220]	[389]
Thallium	8.5j	10.1j	14.2j	4.1j	.23uj
Vanadium	34.8	20.5	26.9	31.2	37.7
Zinc	18800	17600	18300	15900	302

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TABLE 4 CONT.
ANALYTICAL RESULTS FOR
INORGANIC SEDIMENT SAMPLES
RICHARDSON FLAT TAILINGS
SUMMIT COUNTY, UTAH
TDD F08-8903-06 - PAN FUT0039HDA

SAMPLE #	RFT-OSE-1	RFT-OSE-2	RFT-SE-16	RFT-SE-17
PACKING LIST #	4725H-11	4725H-12	4725H-13	4725H-14
SAMPLE LOCATION	OPPORTUNITY POND SEDIMENT SAMPLE	OPPORTUNITY SEEP SEDIMENT SAMPLE	BCKGRND SEDIMENT ON SILVER CREEK	BCKGRND BETWEEN IRRIG DITCH & ROAD ON SILVER
Aluminum	19500	6880	15200	4440
Antimony	142j	49.3j	53.9j	183j
Arsenic	751	839	211	555
Barium	668	557	209	66.0
Beryllium	[2.3]	[1.6]	[1.4]	[.63]
Cadmium	185j	131j	43.9j	113j
Calcium	249000	167000	14500	18900
Chromium	18.2	1.0u	11.8	.72u
Cobalt	[5.9]	53.3	24.6	76.8
Copper	870	456	231	496
Iron	156000	132000	86100	263000
Lead	12500	6900	4430	12200
Magnesium	29700	23400	6340	5880
Manganese	19600	23700	1560	1370
Mercury	1.9	.73	3.3	.81
Nickel	32.1	26.3	22.4	31.4
Potassium	4790	1690	2490	[657]
Selenium	19.9j	2.5j	25.1j	84.0j
Silver	60.6	22.5	15.5	39.8
Sodium	[764]	[206]	[215]	[105]
Thallium	24.1j	21.0j	1.2bj	6.0j
Vanadium	38.0	[18.6]	40.5	[10.4]
Zinc	24000	20000	8580	17500

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TABLE 5
ANALYTICAL RESULTS FOR
INORGANIC SURFACE WATER SAMPLES (µg/l)
RICHARDSON FLAT TAILINGS
SUMMIT COUNTY, UTAH
TDD F08-8903-06 - PAN FUT0039HDA

SAMPLE #	RFT-SW-1A	RFT-SW-1B	RFT-SW-2A	RFT-SW-2B	RFT-SW-3A
TRAFFIC RPT #	MHP-525	MHP-526	MHP-523	MHP-524	MHP-521
SAMPLE LOCATION	BCKGRND PACE HOMER DITCH	BCKGRND PACE HOMER DITCH	SILVER CRK NEAR FLOOD PLAIN TLGS	SILVER CRK NEAR FLOOD PLAIN TLGS	SILVER CRK NEAR FLOOD PLAIN TLGS
Aluminum	[27.9]ub	[26.3]ub	[18.2]ub	44500b	[16.5]ub
Antimony	19.9u	19.9u	[25.7]ub	210b	19.9u
Arsenic	[7.2]	[7.7]	[6.6]	619	[3.8]
Barium	[61.9]ub	[61.9]ub	[61.5]ub	881b	[52.9]ub
Beryllium	1.1u	1.1u	1.1u	[2.4]	1.1u
Cadmium	1.8u	1.8u	[5.0]ub	137b	9.2b
Calcium	132000b	131000b	211000b	248000b	199000b
Chromium	2.8u	2.8u	2.8u	72.2	2.8u
Cobalt	[3.1]ub	2.6u	[3.5]ub	[27.0]ub	[2.6]ub
Copper	1.1u	[2.4]ub	[1.2]ub	1390b	[1.5]ub
Iron	[56.4]ub	[84.7]ub	[63.2]ub	98500b	[39.9]ub
Lead	9.2bj	[0.93]ub	48.3bj	20000bj	38.2bj
Magnesium	34700b	34400b	41400b	68400b	39600b
Manganese	20.3b	19.1b	1170b	3080b	1080b
Mercury	0.20u	0.20u	0.20u	11.50	0.20u
Nickel	9.7u	9.7u	[13.9]	67.3	9.7u
Potassium	[1820]ub	[2110]ub	[3180]	8980b	[3470]ub
Selenium	[15.4]ub	[15.2]ub	[2.6]ub	[34.2]ub	[14.7]ub
Silver	1.6u	1.6u	1.6u	131b	1.6u
Sodium	19700	19700	42300b	42900b	41000b
Thallium	0.90u	0.90u	0.90u	[4.7]	0.90u
Vanadium	2.7u	2.7u	2.7u	129	2.7u
Zinc	64.1b	52.7b	1730b	19300b	2360b

b - Material was detected in the laboratory blanks. Quantity reported is >5X the amount found in the blank (>10X for methylene chloride, acetone, toluene, and phthalates). A false positive result may exist.

u - The material was analyzed for, but was not detected. The associated numerical value is the estimated sample quantitation limit or CRDL.

[ ] - The associated numerical value is an estimated quantity because the amount detected is below the contract required detection limit (CRDL). Presence of the material is reliable. (Inorganic data only).

TABLE 5 CONT.
INORGANIC ANALYTICAL RESULTS FOR
SURFACE WATER SAMPLES
RICHARDSON FLAT TAILINGS
SUMMIT COUNTY, UTAH
TDD F08-8903-06 - PAN FUT0039HDA

SAMPLE #	RFT-SW-3B	RFT-SW-4A	RFT-SW-4B	RFT-SW-5A	RFT-SW-5B
TRAFFIC RPT #	MHP-522	MHP-515	MHP-516	MHP-517	MHP-518
SAMPLE LOCATION	SILVER CRK NEAR FLOOD PLAIN TLGS	UPGRDNT DIVERSION DITCH	UPGRDNT DIVERSION DITCH	DIVERSION DITCH	DIVERSION DITCH
Aluminum	1740b	[32.8]	30900	[32.6]	[33.7]
Antimony	[53.8]ub	[39.3]	937	19.9u	19.9u
Arsenic	41.9	68.6	2326	10.7j	17.4j
Barium	[82.2]ub	[102]	2330	[37.0]	[35.9]
Beryllium	1.1u	1.1u	[1.7]	1.1u	1.1u
Cadmium	[16.0]	[4.6]	289	[3.3]	6.2
Calcium	206000b	180000	446000	308000	314000
Chromium	2.8u	2.8u	50.2	2.8u	2.8u
Cobalt	[5.7]	[8.8]	[48.7]	2.6u	2.6u
Copper	71.4b	[13.6]	1540	[12.4]	[5.6]
Iron	5320b	267	107000	416	696
Lead	1100bj	41.8	22100j	12.9	24.9
Magnesium	42000b	38000	104000	61600	62700
Manganese	1220b	2780	21100	1310	1340
Mercury	0.2ur	0.2u	8.0	0.2u	0.2u
Nickel	9.7u	9.7u	65.5	[25.8]	9.7u
Potassium	[3160]ub	5580	15600	273u	273u
Selenium	[28.5]ub	14.0ur	1.2ur	14.0ur	14.0ur
Silver	[6.3]ub	1.6u	201	1.6u	1.6u
Sodium	42000b	54600	58500	28800	29300
Thallium	0.90u	14.1	83.4j	1.0u	1.0u
Vanadium	[5.5]	2.7u	58.7	2.7u	2.7u
Zinc	3790b	2650	49100	2990	3060

b - Material was detected in the laboratory blanks. Quantity reported is >5X the amount found in the blank (>10X for methylene chloride, acetone, toluene, and phthalates). A false positive result may exist.

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TABLE 5 CONT.
INORGANIC ANALYTICAL RESULTS FOR
SURFACE WATER SAMPLES
RICHARDSON FLAT TAILINGS
SUMMIT COUNTY, UTAH
TDD F08-8903-06 - PAN FUT0039HDA

SAMPLE #	RFT-SW-6A	RFT-SW-6B	RFT-SW-7A	RFT-SW-7B	RFT-SW-8A
TRAFFIC RPT #	MHP-519	MHP-520	MHP-509	MHP-510	MHP-511
SAMPLE LOCATION	DIVERSION DITCH OUTFALL	DIVERSION DITCH OUTFALL	MARSHY AREA	MARSHY AREA	SILVER CRK IN MARSHY AREA
Aluminum	[17.6]	[34.7]ub	11.5u	368	[16.8]
Antimony	19.9u	19.9u	19.9u	19.9u	19.9u
Arsenic	2.3u	[3.9]	2.3u	[9.4]	[5.3]
Barium	[14.9]	[14.9]ub	[14.9]ub	[37.0]	[32.1]
Beryllium	1.1u	1.1u	1.1u	1.1u	1.1u
Cadmium	1.8u	1.8u	1.8u	[2.6]	1.8u
Calcium	316000	330000b	322000	333000	320000
Chromium	2.8u	2.8u	2.8u	2.8u	2.8u
Cobalt	2.6u	[3.8]ub	2.6u	[3.8]	2.6u
Copper	[10.4]	[1.2]ub	[1.9]	[12.9]	1.1u
Iron	426	123	270	1070	224
Lead	1.8u	[1.9]ubj	0.90u	131	0.90u
Magnesium	68200	71200b	68700	70500	68600
Manganese	3180	3170b	94.8	2110	960
Mercury	0.2u	0.2u	0.2u	0.2u	0.2u
Nickel	[13.2]	9.7u	9.7u	9.7u	9.7u
Potassium	[2010]	[2230]	[1480]	[1710]	[1330]
Selenium	14.0ur	12.0u	14.0ur	1.4ur	14.0ur
Sodium	45000	49600b	47500	48400	46700
Silver	1.6u	1.6u	1.6u	[2.4]	1.6u
Thallium	1.0u	0.9u	1.0u	1.0u	1.0u
Vanadium	2.7u	2.7u	2.7u	2.7u	2.7u
Zinc	219	198b	190	656	295

j - The associated numerical value is an estimated quantity because the amount detected is below the contract required detection limit (CRDL) or because minor quality control criteria were not met. Presence of the material is reliable.

u - The material was analyzed for, but was not detected. The associated numerical value is the estimated sample quantitation limit or CRDL.

[] - The associated numerical value is an estimated quantity because the amount detected is below the contract required detection limit (CRDL). Presence of the material is reliable. (Inorganic data only).

TABLE 5 CONT.
INORGANIC ANALYTICAL RESULTS FOR
SURFACE WATER SAMPLES
RICHARDSON FLAT TAILINGS
SUMMIT COUNTY, UTAH
TDD F08-8903-06 - PAN FUT0039HDA

SAMPLE #	RFT-SW-8B	RFT-SW-9A	RFT-SW-9B	RFT-SW-10A	RFT-SW-10B
TRAFFIC RPT #	MHP-512	MHP-506	MHP-507	MHP-503	MHP-504
SAMPLE LOCATION	SILVER CRK IN MARSHY AREA	CULVERT NEAR ROUTE 40	CULVERT NEAR ROUTE 40	DNGRDNT SAMPLE	DNGRDNT SAMPLE
Aluminum	[106]	[24.6]	370	[26.6]	[75.8]
Antimony	19.9u	19.9u	19.9u	19.9u	19.9u
Arsenic	[8.4]	[6.8]	12.2	[3.3]	[5.6]r
Barium	[33.5]	[54.6]	[59.1]	[51.5]	[52.5]
Beryllium	1.1u	1.1u	1.1u	1.1u	1.1u
Cadmium	1.8u	1.8u	1.8u	[2.0]	[2.2]
Calcium	303000	139000	144000	147000	147000
Chromium	2.8u	2.8u	[2.8]	2.8u	2.8u
Cobalt	2.6u	[2.6]	2.6u	2.6u	[4.0]
Copper	[4.9]	[2.9]	[11.7]	[6.3]	[5.6]
Iron	1090	338	1200	195	481
Lead	36.6	6.2	122	[5.9]	35.8
Magnesium	64900	34600	35600	36400	36200
Manganese	950	274	335	223	240
Mercury	0.2u	0.2u	0.2u	0.2u	0.2u
Nickel	9.7u	9.7u	9.7u	9.7u	9.7u
Potassium	[986]	[1790]	[1980]	2090	[1920]
Selenium	14.0ur	14.0ur	1.4ur	1.4ur	14.0ur
Silver	1.6u	1.6u	1.6u	1.6u	1.6u
Sodium	44300	22900	23400	25200	24100
Thallium	1.0u	1.0u	1.0u	1.0u	1.0u
Vanadium	2.7u	2.7u	2.7u	2.7u	2.7u
Zinc	332	429	726	419	519

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TABLE 5 CONT.
INORGANIC ANALYTICAL RESULTS FOR
SURFACE WATER SAMPLES
RICHARDSON FLAT TAILINGS
SUMMIT COUNTY, UTAH
TDD F08-8903-06 - PAN FUT0039HDA

SAMPLE #	RFT-SW-11A	RFT-SW-11B	RFT-SW-12A	RFT-SW-12B	RFT-SW-15A	RFT-SW-15B	RFT-SW-16A
TRAFFICE RPT #	MHP-528	MHP-527	MHP-513	MHP-514	MHP-529	MHP-530	MHP-534
SAMPLE LOCATION	DUPLICATE OF 2A	DUPLICATE OF 2B	FILTERED BLANK	UNFILTERED BLANK	FILTERED BLANK	UNFILTERED BLANK	DNSTRM OF PACE HOMER DITCH CONFLUENCE W/SILVER CK
Aluminum	[28.0]ub	43400b	[23.3]	[16.6]	[24.9]ub	[32.1]ub	[44.6]ub
Antimony	[26.9]ub	199b	19.9u	19.9u	19.9u	19.9u	[20.1]ub
Arsenic	[5.6]	540	2.3u	12.0	2.3u	2.3u	2.3u
Barium	[60.8]	788b	1.3u	1.3u	1.3u	1.3u	[56.7]ub
Beryllium	1.1u	[2.1]	1.1u	1.1u	1.1u	1.1u	1.1u
Cadmium	6.0b	127b	1.8u	1.8u	1.8u	1.8u	10.3b
Calcium	211000b	246000b	[154]	[56.3]	[214]ub	[136]ub	205000b
Chromium	2.8u	68.5	[3.5]	2.8u	2.8u	2.8u	2.8u
Cobalt	[5.3]	[28.4]ub	2.6u	2.6u	2.6u	2.6u	[3.1]ub
Copper	[1.2]	1260b	1.1u	[4.4]	1.1u	1.1u	[2.7]ub
Iron	[55.1]	89300b	277	219	[64.2]ub	[41.5]ub	[31.5]ub
Lead	34.6bj	17900bj	0.90u	0.90u	[1.8]ubj	[1.6]ubj	[1.4]ubj
Magnesium	41400b	67100b	[42.5]	20.9u	[43.7]ub	[29.0]ub	40400b
Manganese	1180b	2950b	[2.3]	[2.0]	[1.4]ub	[2.5]ub	1070b
Mercury	0.20u	8.50	0.2u	0.2u	.20u	.20u	.20u
Nickel	9.7u	57.3	9.7u	9.7u	9.7u	9.7u	9.7u
Potassium	[3060]ub	8770b	273u	273u	273u	273u	[3180]ub
Selenium	[15.1]ub	[43.9]ub	1.4ur	1.4ur	1.2u	1.2u	[2.7]ub
Silver	1.6u	117	1.6u	1.6u	1.6u	23.8b	1.6u
Sodium	41200	42700	[68.9]	[76.0]	[47.5]ub	13.2u	41900b
Thallium	0.90u	[4.2]	1.0u	1.0u	.90u	.90u	.90u
Vanadium	[3.8]	121	2.7u	2.7u	2.7u	2.7u	2.7u
Zinc	1730b	17700b	[4.5]	1.3u	[12.6]ub	[6.5]ub	2970b

b - Material was detected in the laboratory blanks. Quantity reported is >5X the amount found in the blank (>10X for methylene chloride, acetone, toluene, and phthalates). A false positive result may exist.

j - The associated numerical value is an estimated quantity because the amount detected is below the contract required detection limit (CRDL) or because minor quality control criteria were not met. Presence of the material is reliable.

r - Quality control indicates that data is not usable (material may or may not be present). **DO NOT USE THIS DATA!.**

u - The material was analyzed for, but was not detected. The associated numerical value is the estimated sample quantitation limit or CRDL.

TABLE 5 CONT.
INORGANIC ANALYTICAL RESULTS FOR
SURFACE WATER SAMPLES
RICHARDSON FLAT TAILINGS
SUMMIT COUNTY, UTAH
TDD F08-8903-06 - PAN FUT0039HDA

SAMPLE #	RFT-SW-16B	RFT-SW-17A	RFT-SW-17B	RFT-SW-18A	RFT-SW-18B
TRAFFIC RPT #	MHP-535	MHP-537	MHP-538	MHP-539	MHP-540
SAMPLE LOCATION	DNSTRM OF PACE HOMER DITCH CONFLUENCE W/SILVER CRK	UPGRDNT CONFLUENCE SILVER CRK PACE HOMER DITCH	UPGRDNT CONFLUENCE SILVER CRK PACE HOMER DITCH	BLANK	BLANK
Aluminum	[61.1]ub	[49.5]ub	[29.6]ub	[29.0]ub	[27.0]ub
Antimony	19.9u	19.9u	[20.1]ub	19.9u	19.9u
Arsenic	[5.6]	2.3u	2.3u	2.3u	2.3u
Barium	[56.0]ub	[54.3]ub	[51.1]ub	[1.7]ub	1.3u
Beryllium	1.1u	1.1u	1.1u	1.1u	1.1u
Cadmium	10.3b	13.3b	13.5b	1.8u	1.8u
Calcium	205000b	228000b	218000b	[109]ub	[90.8]ub
Chromium	2.8u	2.8u	2.8u	2.8u	2.8u
Cobalt	[3.5]ub	[6.6]ub	[5.3]ub	2.6u	[2.7]ub
Copper	[4.9]ub	[3.9]ub	[1.5]ub	1.1u	1.1u
Iron	496b	346bj	[43.7]ub	[33.4]ub	[32.2]ub
Lead	25.2bj	8.8b	0.90uj	[1.3]ub	0.90uj
Magnesium	40300b	41800b	39900b	[38.6]ub	[27.8]ub
Manganese	1080b	1380b	1330b	[2.0]ub	[1.4]ub
Mercury	0.20u	0.20u	0.20u	0.20u	0.20u
Nickel	[10.6]	9.7u	9.7u	9.7u	9.7u
Potassium	[3380]ub	[3630]ub	[3570]ub	273u	[437]ub
Selenium	1.2u	[20.0]ub	[18.0]ub	1.2u	1.2u
Silver	1.6u	1.6u	1.6u	1.6u	1.6u
Sodium	41900	48000b	46400b	[41.8]ub	[13.3]ub
Thallium	0.90u	0.90u	0.90u	0.90u	0.90u
Vanadium	2.7u	2.7u	2.7u	2.7u	2.7u
Zinc	3130b	3880b	3720b	[2.9]ub	1.3u

b - Material was detected in the laboratory blanks. Quantity reported is >5X the amount found in the blank (>10X for methylene chloride, acetone, toluene, and phthalates). A false positive result may exist.

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TABLE 5 CONT.
INORGANIC ANALYTICAL RESULTS FOR
SURFACE WATER SAMPLES
RICHARDSON FLAT TAILINGS
SUMMIT COUNTY, UTAH
TDD F08-8903-06 - PAN FUT0039HDA

SAMPLE #	RFT-OPW-1A	RFT-OPW-1B
TRAFFIC RPT #	MHP-532	MHP-533
SAMPLE LOCATION	PONDED AREA AT BASE OF TLGS DAM	PONDED AREA AT BASE OF TLGS DAM
Aluminum	[23.0]ub	317b
Antimony	19.9u	19.9u
Arsenic	[2.9]	33.1
Barium	[37.3]ub	[82.2]ub
Beryllium	1.1u	1.1u
Cadmium	1.8u	[3.6]ub
Calcium	312000	369000b
Chromium	2.8u	2.8u
Cobalt	[6.3]ub	[5.6]ub
Copper	[1.2]ub	[6.6]ub
Iron	503b	10200b
Lead	0.90u	68.2bj
Magnesium	56100b	58800b
Manganese	12900b	21400b
Mercury	0.20u	0.20u
Nickel	9.7u	9.7u
Potassium	5380	9960
Selenium	12.0u	[18.5]ub
Silver	1.6u	1.6u
Sodium	60000b	63400b
Thallium	0.90u	0.90u
Vanadium	2.7u	2.7u
Zinc	[19.8]ub	759b

b - Material was detected in the laboratory blanks. Quantity reported is >5X the amount found in the blank (>10X for methylene chloride, acetone, toluene, and phthalates). A false positive result may exist.

u - The material was analyzed for, but was not detected. The associated numerical value is the estimated sample quantitation limit or CRDL.

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APPENDIX A

SAMPLE COLLECTION AND SHIPMENT INFORMATION

APPENDIX A
SAMPLE COLLECTION AND SHIPMENT INFORMATION
RICHARDSON FLAT TAILINGS
SUMMIT COUNTY, UTAH
TDD F08-8903-06 - PAN FUT0039HDA

SAMPLE ID	PARAMETERS	TRAFFIC RPT #	SAMPLE TAG #	CHAIN OF CUSTODY
RFT-SW-1A	METALS	MHP-525	8-94551	8-11438
RFT-SW-1B	METALS	MHP-526	8-94552	8-11438
RFT-SW-2A	METALS	MHP-523	8-94553	8-11438
RFT-SW-2B	METALS	MHP-524	8-94556	8-11438
RFT-SW-3A	METALS	MHP-521	8-94554	8-11438
RFT-SW-3B	METALS	MHP-522	8-94555	8-11438
RFT-SW-4A	METALS	MHP-515	8-94557	8-11438
RFT-SW-4B	METALS	MHP-516	8-94558	8-11438
RFT-SW-5A	METALS	MHP-517	8-94559	8-11438
RFT-SW-5B	METALS	MHP-518	8-94560	8-11438
RFT-SW-6A	METALS	MHP-519	8-94561	8-11438
RFT-SW-6B	METALS	MHP-520	8-94562	8-11438
RFT-SW-7A	METALS	MHP-509	8-94563	8-11446
RFT-SW-7B	METALS	MHP-510	8-94564	8-11446
RFT-SW-8A	METALS	MHP-511	8-94565	8-11446
RFT-SW-8B	METALS	MHP-512	8-94566	8-11446
RFT-SW-9A	METALS	MHP-506	8-94567	8-11446
RFT-SW-9B	METALS	MHP-507	8-94587	8-11446
RFT-SW-10A	METALS	MHP-503	8-94568	8-11446
RFT-SW-10B	METALS	MHP-504	8-94569	8-11446
RFT-SW-11A	METALS	MHP-528	8-94591	8-10998
RFT-SW-11B	METALS	MHP-527	8-94590	8-10998
RFT-SW-12A	METALS	MHP-513	8-94588	8-10998
RFT-SW-12B	METALS	MHP-514	8-94589	8-10998
RFT-SW-15A	METALS	MHP-529	8-94593	8-10998
RFT-SW-15B	METALS	MHP-530	8-94593	8-10998
RFT-SW-16A	METALS	MHP-534	8-94599	8-10997
RFT-SW-16B	METALS	MHP-535	8-94600	8-10997
RFT-SW-17A	METALS	MHP-537	8-94527	8-10997
RFT-SW-17B	METALS	MHP-538	8-94527	8-10997
RFT-SW-18A	METALS	MHP-539	8-94529	8-10997
RFT-SW-18B	METALS	MHP-540	8-94530	8-10997
RFT-TA-1	METALS	MHL-955	8-94580	8-11446
RFT-TA-2	METALS	MHL-956	8-94581	8-11446
RFT-TA-3	METALS	MHP-500	8-94582	8-11446
RFT-TA-4	METALS	MHP-501	8-94583	8-11446
RFT-TA-5	METALS	MHP-502	8-94584	8-11446

APPENDIX A CONT.
SAMPLE COLLECTION AND SHIPMENT INFORMATION
RICHARDSON FLAT TAILINGS
SUMMIT COUNTY, UTAH
TDD F08-8903-06 - PAN FUT0039HDA

SAMPLE ID	PARAMETERS	SAS #	SAMPLE TAG #	CHAIN OF CUSTODY
RFT-SE-1	METALS	4725H-01	8-94570	8-11437
RFT-SE-2	METALS	4725H-02	8-94571	8-11437
RFT-SE-3	METALS	4725H-03	8-94572	8-11437
RFT-SE-4	METALS	4725H-04	8-94573	8-11437
RFT-SE-5	METALS	4725H-05	8-94574	8-11437
RFT-SE-6	METALS	4725H-06	8-94575	8-11437
RFT-SE-7	METALS	4725H-07	8-94576	8-11437
RFT-SE-8	METALS	4725H-08	8-94577	8-11437
RFT-SE-9	METALS	4725H-09	8-94578	8-11437
RFT-SE-10	METALS	4725H-10	8-94579	8-11437
RFT-SE-16	METALS	4725H-13	8-94525	8-11440
RFT-SE-17	METALS	4725H-1	8-94528	8-11440

APPENDIX B

SAMPLING PHOTO LOG

PHOTO 1: WEST FACING PHOTO OF SAMPLE LOCATION RFT-SW/SE-4.

PHOTO 2: WEST FACING PHOTO OF FIT MEMBER COLLECTING TAILINGS SAMPLE RFT-TA-1.

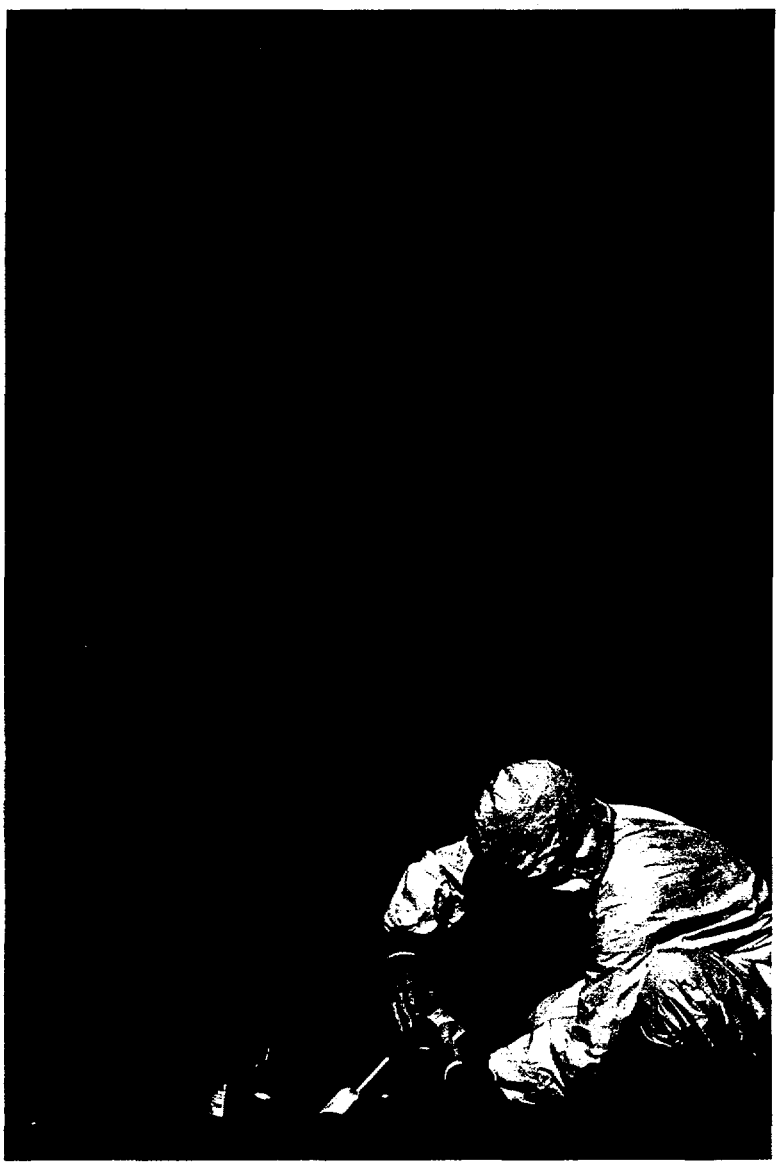


PHOTO 3 (LEFT): NORTHWEST FACING PHOTO OF FIT MEMBER COLLECTING TAILINGS SAMPLE RFT-TA-2.

PHOTO 4 (BELOW): SOUTH FACING PHOTO OF FIT MEMBER COLLECTING TAILINGS SAMPLE RFT-TA-3.

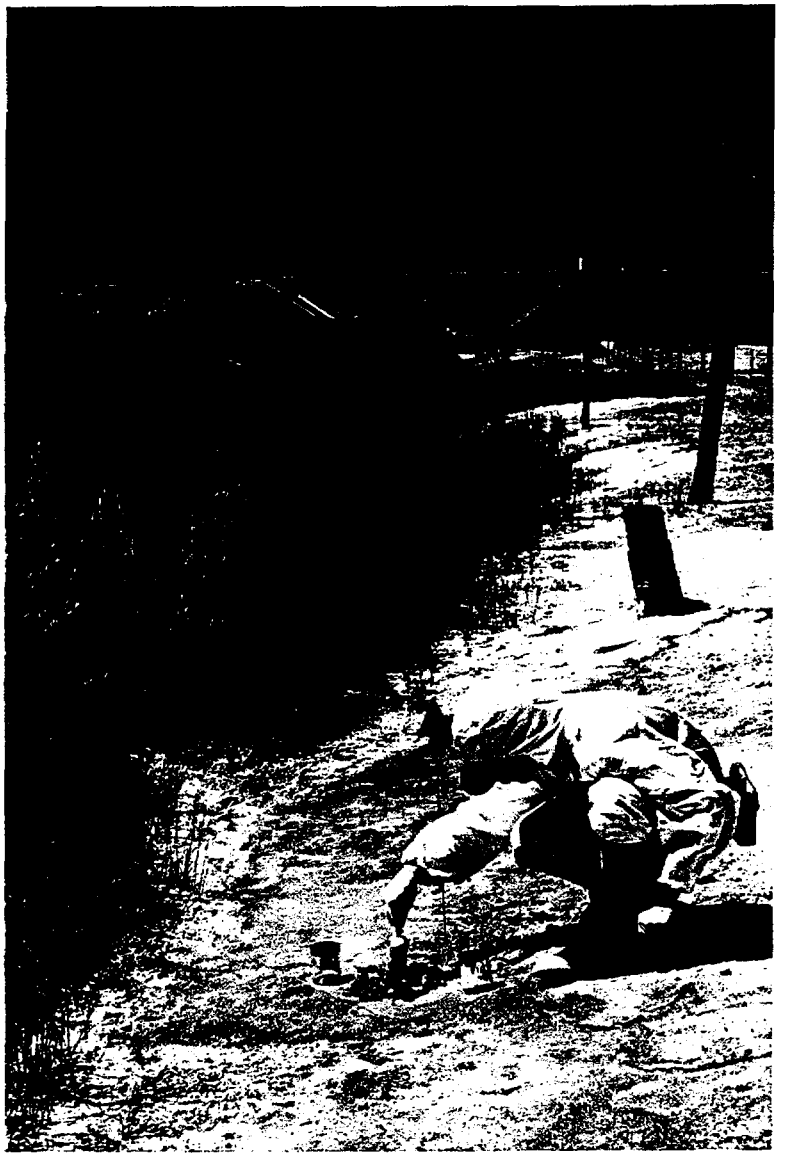


PHOTO 5: SOUTHWEST VIEW OF SAMPLE LOCATION RFT-TA-4.

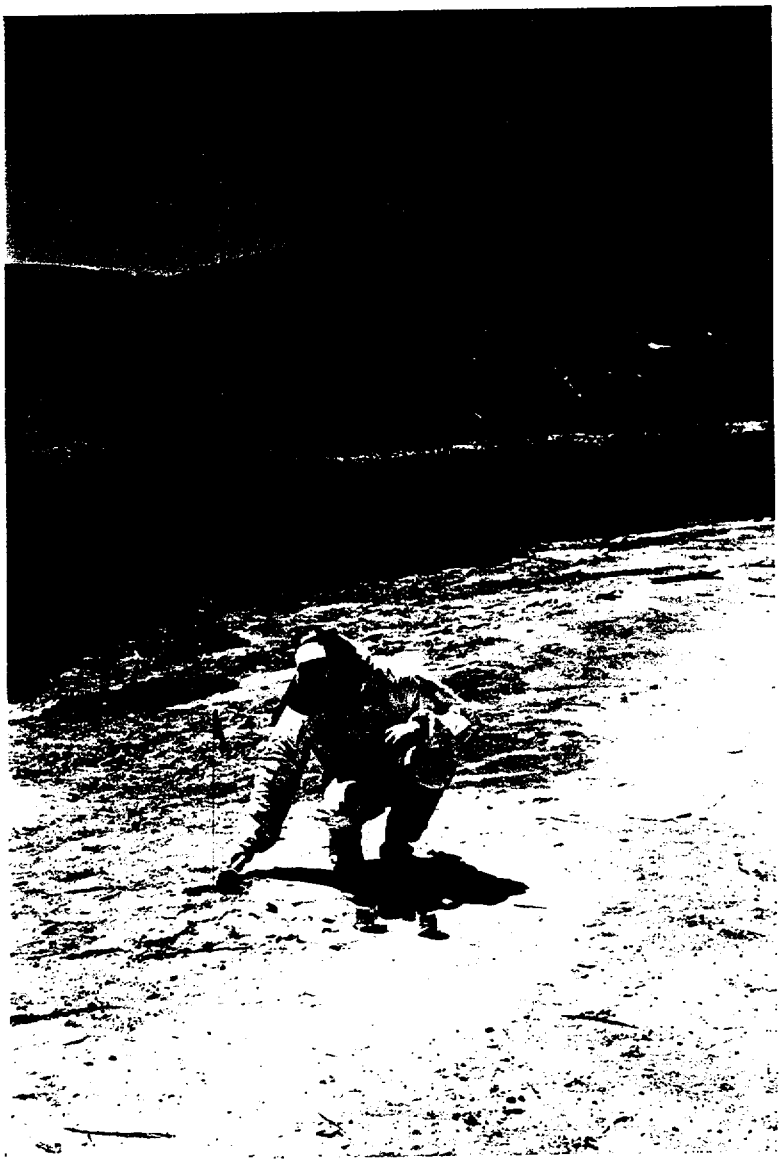


PHOTO 6: SOUTH VIEW OF SAMPLE LOCATION RFT-TA-5.

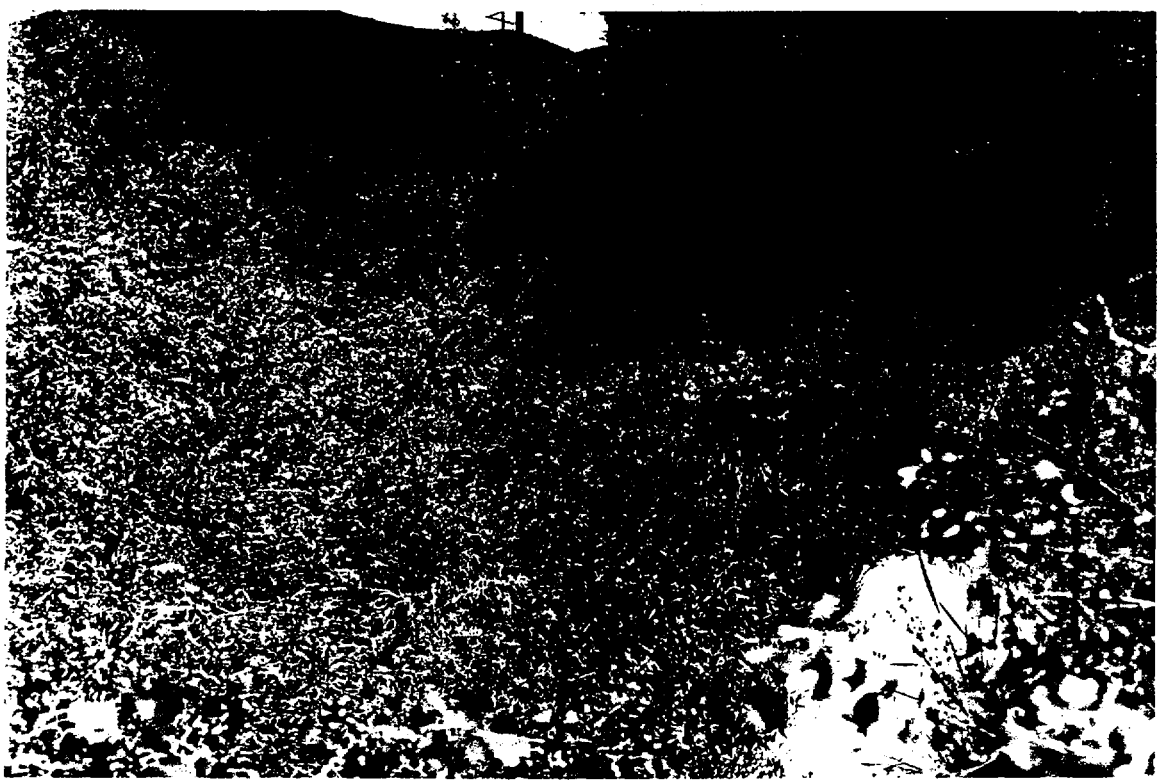
PHOTO 7: FIT MEMBER COLLECTING SAMPLE RFT-SW-9.

PHOTO 8: NORTHEAST FACING PHOTO OF FIT MEMBER COLLECTING SURFACE WATER SAMPLE RFT-SW/SE-7.

PHOTO 9: SOUTHEAST FACING PHOTO OF FIT MEMBER COLLECTING SAMPLE RFT-SW/SE-8.

PHOTO 10: NORTH FACING PHOTO OF SAMPLE LOCATION RFT-SW/SE-6.

PHOTO 11: WEST FACING PHOTO OF SAMPLE LOCATION RFT-SW/SE-5.



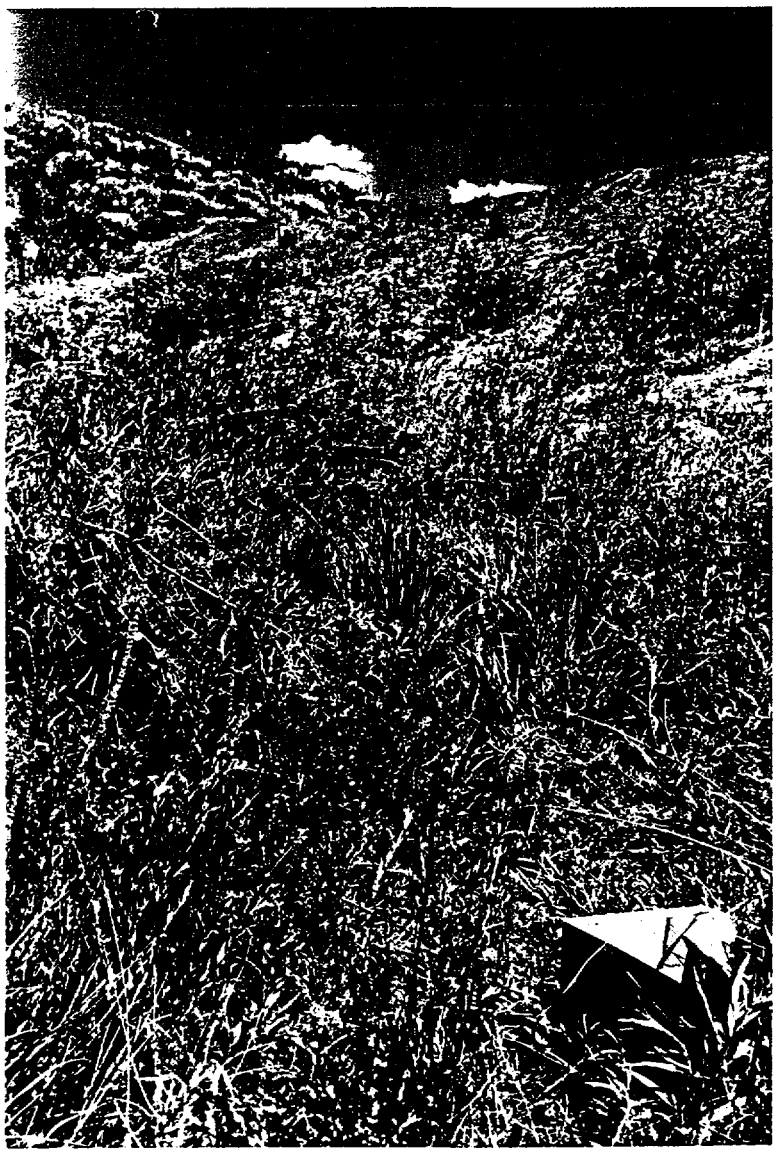


PHOTO 12 (ABOVE): SOUTH FACING PHOTO OF SURFACE WATER SAMPLE LOCATION RFT-OPW-1 AND RFT-OSE-1 AT BASE OF TAILINGS DAM.

PHOTO 13 (LIFT): NORTHEAST FACING PHOTO OF OPPORTUNITY SEDIMENT SAMPLE LOCATION RFT-OSE-2.

APPENDIX C

QUALITY ASSURANCE REVIEW

REGION VIII SUMMARY OF DATA QUALITY ASSURANCE REVIEW

guideline references are from Contract #787

Case No.: 12334 TDD No.: FO-8909-08

Site: Richardson Flats

Contractor Laboratory: Silver Valley Labs, Inc.; Kellogg, ID

Data Reviewer : Lynn Fischer Date of Review: Oct. 11, 1989

Sample Matrix: 19 low waters

Analysis: Metals and Mercury.

Sample Nos.: MHP520, MHP521, MHP522, MHP523, MHP524, MHP525, MHP526, MHP527, MHP528, MHP529, MHP530, MHP532, MHP533, MHP534, MHP535, MHP537, MHP538, MHP539, and MHP540.

( ) Data are acceptable for use.

(X) Data are acceptable for use with qualifications noted.

( ) Data are preliminary - pending verification.

( ) Data are unacceptable.

Action required by DPO?

No X Yes ___ The following items require action:

All Mercury data is unusable because of missed holding times. Mercury analysis however was performed by Keystone, TX prior to samples being shipped on to Silver Valley for analysis, this data is being used. SMO, or whomever decided to forward the samples should always consider holding time requirements when making these decisions.

Action required by project officer?

No X Yes ___

The following are our findings:

Data are acceptable for use, with the exception of the mercury analysis, with the following qualifications.

Holding time criteria were met for all analysis with the exception of the mercury cold vapor analysis; all the mercury results are flagged "a", unusable.

All calibration frequencies and requirements were met.

Quite a few contaminants were detected in analysis of the initial, continuing, and laboratory preparation blanks they are: aluminum, antimony, barium, calcium, cadmium, cobalt, copper, iron, magnesium, manganese, potassium, selenium, silver, sodium, zinc, and lead. All samples with positive results for these analytes were flagged "ub", "uj", or "b". "UB" was used to flag those results detected below the contract required detection limit (CRDL), "uj" was used to flag those results greater than the CRDL but less than five times the greatest amount detected in any blank, and "b" was used to flag all other positive results.

Brackets are applied to all results greater than the instrument detection limit (IDL) but less than the CRDL.

Duplicate results for the following analytes were outside limits (+/- 20%), however none were flagged because all were associated with either results below the CRDL, contaminants detected in the blanks, or one of the values was undetected: aluminum, copper, iron, potassium, arsenic, and selenium.

Analysis of the spiked sample had two outliers, lead (16.7%) and selenium (-134.3%), limits are (75-125%). All lead results were flagged "j", results may be biased low. No flags were added to selenium results since both the sample and spiked sample results were less than the CRDL.

All other quality control (QC) criteria were met.

Inorganic Data Completeness Checklist

Inorganic analysis data (Form I)

Initial calibration and continuing calibration verification (Form IIA)

CRDL standard for AA and ICP (Form IIB)

Blanks (Form III)

ICP interference Check sample (Form IV)

Spike sample recovery (Form VA)

Post digestion spike sample recovery (Form VB)

Duplicates (Form VI)

Laboratory control sample (Form VII)

Standard addition results (Form VIII)

ICP serial dilutions (Form IX)

Holding times (Form X)

Instrument detection limits-quarterly (Form XI)

ICP interelement correction factors-quarterly (Form II)

ICP linear ranges-quarterly (Form XIII)

Raw data for interference checks

Raw data for calibration standards

Raw data for blanks

Raw data for CRI and/or CRA

Raw data for samples

Raw data for duplicates

Raw data for spikes

Traffic reports

Contract Compliance

I. **Initial and Continuing Calibration Verification (ICV and CCV)** (guidelines pg. E-4, Form IIA)

1. Was instrument calibrated daily and each time it was set up?
   yes X no ___

2. Were instruments calibrated using 1 blank and several standards?
   yes X no ___

3. Were calibration verifications within 90-110%?
   yes X no ___

4. Were continuing calibrations run at 10% frequency?
   yes X no ___

5. Were the raw data correctly transcribed onto Form IIA?
   yes X no ___

II. **CRDL Standards for ICP (CRI) and/or AA (CRA)** (guidelines pg. E-6, Form IIB)

1. For ICP analysis, were standards (CRI) @ 2x the CRDL or the IDL (whichever was greater) analyzed at the beginning and the end of each sample run, or at a minimum of twice/8 hour shift, whichever was more frequent?
   yes X no ___

2. For furnace AA analysis, were standards (CRA) analyzed at the beginning and the end of each sample run, or at a minimum of twice/8 hour shift, whichever was more frequent?
   yes X no ___

3. Were the CRI and/or CRA standards analyzed after the ICV?
   yes X no ___

4. Were these data reported on Form IIB?
   yes X no ___

5. Were the raw data correctly transcribed onto Form IIB?
   yes X no ___

III. **Blanks** (guidelines pg. E-6, Form III)

1. Was the initial calibration blank (ICB) analyzed immediately after the initial calibration verification (ICV)?
   yes X no ___

2. Was a continuing calibration blank (CCB) analyzed immediately after each continuing calibration verification (CCV)?
   yes X no ___

3. Was a preparation blank (PB) analyzed at a frequency of at least 1 in 20 samples?
   yes X no ___ NA

4. How many elements were detected above the CRDLs? o (if 0, go to question 5)

4a. How many elements were detected in the blanks at greater than one-half the amount detected in any sample?

5. Were raw data correctly transcribed onto Form III?
yes X no ___

Comments: See narrative for elements detected in blanks.

IV. ICP Interference Checks (ICS) (guidelines pg. E-7, Form IV)

1. Was the ICS analyzed twice per 8 hour shift?
yes X no ___

2. Were the ICSs analyzed before and after samples?
yes X no ___

3. Was any massive interference detected?
yes ___ no X

4. Were the ICSs within ±20% mean value?
yes X no ___

5. Were raw data correctly transcribed onto Form IV?

V. Spike Sample Analysis (S) (guideline pg. E-8, Form V)

1. Were spikes analyzed at a frequency of 1 in 20 samples?
yes X no ___

2. Were spike recoveries correctly calculated?
yes X no ___

$$\% \text{ recovery} = \frac{(SSR - SR)}{SA} \times 100$$

SSR = Spiked Sample Result
SR = Sample Result
SA = Spike Added

3. Were spike recoveries within the range of 75-125%?
yes ___ no X

3a. For recoveries outside this range, were associated data flagged "N" by the laboratory on Forms I and V?
yes X no ___ NA ___

(an exception if granted where the sample concentration is >4X the spike concentration)

4. Were raw data correctly transcribed onto Form V?

yes X no ___

* Refer to page E-9 (SOW 787) for information regarding the amount of spike to be added for each analyte and for other information about the Spike Sample Analysis.

VI. Duplicates (D) (guidelines pg. E-11, Form VI)

1. Were duplicates analyzed at a frequency of 1 in 20 samples?
yes X no ___

2. Were RPDs correctly calculated?
yes X no ___

$$RPD = \frac{S - D}{(S + D)/2} \times 100$$

S = Sample
D = Duplicate

3a. **For sample concentrations >5x the CRDL, were RPDs ±20%? (limits of ±35% apply for soil/sediment/tailings samples)**
yes X no ___ NA ___

3b. **For sample concentrations >5x the CRDL, did duplicate analysis results fall outside the control window of ± the CRDL?**
yes ___ no X NA ___

3c. **Where the RPDs exceeded the control limits, were the data flagged '*' on Forms I and VI by the laboratory?**
yes X no ___ NA ___

4. **Were raw data correctly transcribed onto Form VI?**
yes X no ___

* Other Considerations:
- Field blanks cannot be used for duplicate analyses
- Duplicates must be analyzed for each analytical method

VII. Laboratory Control Sample (LCS) Analysis (guideline pg. E-12, Form VII)

1. Was an LCS analyzed for every sample delivery group or batch of samples, whichever was more frequent?
yes X no ___

2. Were recoveries within the 80-120% limit?
yes X no ___

-if the recoveries were outside this range the analysis must be terminated, the problem corrected and the previous samples associated with that LCS redigested and reanalyzed.

3. Were the raw data correctly transcribed onto Form VII?
yes X no ___

VIII. Furnace Atomic Absorption (AA) QC Analysis (guidelines pg. E-14, Form VIII)

1. Does the raw data package contain absorbance values for two injections per sample, the average values and the relative standard deviation (RSD)?
yes X no ___

2. For analyte concentrations > the CRDL, did the RSD for the duplicate injections agree within 20%? (if yes, go to question 3)
yes X no ___

$$RSD = \frac{SD}{M} \times 100$$

SD = Standard Deviation of Duplicate Injections
M = Mean of Duplicate Injections

2a. Were samples that exceeded the 20% criteria reanalyzed?
yes ___ no ___

2b. Did any reanalyzed samples exceed the 20% criteria?
yes ___ no ___

2c. If yes, did the laboratory flag the data of Form I with an 'M'?
yes no

3. Was the recovery of the spike > 40%? (if yes, go to question 4).
yes X no ___

If no, was the sample diluted and rerun with another spike?
yes no

4. Was sample absorbance >50% of spike absorbance?* (if yes, go to question 5).
yes __ no X

* Spike absorbance = absorbance of spiked sample - absorbance of sample.

4a. For spike recoveries between 85 and 115%, were results reported to the IDL?
yes X no ___

$$RPD = \frac{(SSR - SR)}{SA} \times 100$$

SSR = Spike Sample Recovery
SR = Sample Result
SA = Spike Added

4b. For spike recoveries outside the 85 and 115% range, were results reported to the IDL and flagged with 'W'?
yes X no ___

5. Was spike recovery between 85 and 115%? (if no, go to question 6)

5a. Were results quantified from calibration curve and reported to IDL?
yes ___ no ___

6. Was an MSA at 50, 100 and 150% of the sample absorbance analyzed?
yes no

6a. Was each MSA analysis identified in the raw data along with the slope, intercept and correlation coefficient?
yes no

6b. Were these data correctly transcribed onto Form VIII?

yes no

6c. Were correlation coefficients(r) > 0.995?
yes no

6d. If no, were MSAs run once more?
yes no

- If the correlation coefficients were still > 0.995, data on Form I must be from the run with the best 'r' and the data on Forms I and VII must be flagged with a '+'.

Were these criteria met?
yes no

6e. Were all MSA obtained data marked with an 'S' or an S+ on form I?
yes no

IX. ICP Serial Dilution (L) Analysis (guidelines pg. E-12, Form IX)

1. Was an ICP serial dilution performed on each group of samples of a similar matrix (i.e., soil, water) and concentration (i.e., low, high) or for each sample delivery group, whichever was more frequent?
yes X no ___

2. For elements with concentrations >10X the CRDL, did any exceed the serial dilution results by more than 10%? (if no, skip questions 3 and 4)
yes X no ___

$$\% \text{ difference} = \frac{I - S}{I} \times 100$$

I = Initial Sample Result
S = Serial Dilution Result (instrument reading X5)

3. Which elements had concentrations that exceeded the 10% criteria? only those associated with undetected values or blank contaminanats.

4. Did the laboratory flag these data with an 'E' on Form IX?
yes no

5. Were the raw data correctly transcribed onto Form IX?
yes X no ___

X. Instrument Detection Limits (IDL) (guidelines pg. E-13, Form XI)

1. Were IDLs reported for each analyzed element?
yes X no ___

2. Were IDLs reported for each instrument used?
yes X no ___

3. Did the IDLs meet the contract requirements? (refer to pg. E-13, SOW 787)
yes X no

XI. Interelement Corrections for ICP (guidelines pg. E-13, Form XII)

1. Were correction factors reported on Form XII?
   yes X no ___

XII. Linear Range Analysis (LRA) (guidelines pg. E-14, Form XII)

1. Was a linear range verification standard analyzed?
   yes X no ___

2. Was the results within ±5% of the true value?
   yes X no ___

Holding Times

Limits: Metals - 6 months; Hg - 30 days; Cn - 28 days.

1. Verified date of sample receipt by laboratory 8-16-89
2. Date of preparation/analyses ICP - 8-24-89
   AS - 8-31-89
   SE - 8-31-89
   PB - 8-29-89
   TL - 8-24-89
3. Were holding times met? yes X, for all but HG

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO. MHP520

Lab Name: SILVER VALLEY LABS., INC. Contract: 68-D8-0074

Lab Code: SILVER Case No.: 12334 SAS No.: _____ SDG No.: MHP520

Matrix (soil/water): WATER Lab Sample ID: _____

Level (low/med): LOW Date Received: 08/16/89

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	[34.7]	B	UB	P	LAF
7440-36-0	Antimony	19.9	U		P	
7440-38-2	Arsenic	[3.9 40.0]	B		P	MAB 10/10/89
7440-39-3	Barium	[14.9]	B		P	LAF
7440-41-7	Beryllium	1.1	U		P	
7440-43-9	Cadmium	1.8	U		P	
7440-70-2	Calcium	830000.		B	P	LAF
7440-47-3	Chromium	2.8	U		P	
7440-48-4	Cobalt	[3.8]	B		P	LAF
7440-50-8	Copper	[1.2]	B		P	LAF
7439-89-6	Iron	123.			P	
7439-92-1	Lead	[1.6]	B	N	P	LAF
7439-95-4	Magnesium	71200.		B	P	LAF
7439-96-5	Manganese	3170.		B	P	LAF
7439-97-6	Mercury	0.2	U	R	CV	LAF
7440-02-0	Nickel	9.7	U		P	
7440-09-7	Potassium	[2230.	B		P	LAF
7782-49-2	Selenium	12.0	U	N*	P	LAF
7440-22-4	Silver	1.6	U		P	
7440-23-5	Sodium	49600.		B	P	LAF
7440-28-0	Thallium	0.9	U		P	
7440-62-2	Vanadium	2.7	U		P	
7440-66-6	Zinc	198.		B	P	LAF
	Cyanide				NR	

Color Before: COLORLESS Clarity Before: CLEAR Texture: _____

Color After: COLORLESS Clarity After: CLEAR Artifacts: _____

Comments:

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MHP521

Lab Name: SILVER VALLEY LABS, INC. Contract: ~~68-D9-0071~~ 68-W80074 MAB 10/20/89

Lab Code: SILVER Case No.: 12334 SAS No.: SDG No.: MHP520

Matrix (soil/water): WATER Lab Sample ID:

Level (low/med): LOW Date Received: 08/16/89

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	[16.5]	B	WB	P	LAF
7440-36-0	Antimony	19.9	U		P	
7440-38-2	Arsenic	[3.8]	B	N	F	MAB 09/08/89
7440-39-3	Barium	[52.9]	B	WB	P	LAF
7440-41-7	Beryllium	1.1	U		P	
7440-43-9	Cadmium	9.2		B	P	LAF
7440-70-2	Calcium	199000		B	P	LAF
7440-47-3	Chromium	2.8	U		P	
7440-48-4	Cobalt	[2.6]	B	WB	P	LAF
7440-50-8	Copper	[1.5]	B	WB	P	LAF
7439-89-6	Iron	[39.9]	B	WB	P	LAF
7439-92-1	Lead	38.2		NS ~~B~~	F	MAB 09/08/89
7439-95-4	Magnesium	39600		B	P	LAF
7439-96-5	Manganese	1080		B	P	LAF
7439-97-6	Mercury	0.20	U	N R	CV	MAB 09/08/89 LAF
7440-02-0	Nickel	9.7	U		P	
7440-09-7	Potassium	[3470]	B	WB	P	LAF
7782-49-2	Selenium	14.7	B	N* WB	F	LAF
7440-22-4	Silver	1.6	U		P	
7440-23-5	Sodium	41000		B	P	LAF
7440-28-0	Thallium	0.90	U	N	F	LAF
7440-62-2	Vanadium	2.7	U		P	
7440-66-6	Zinc	2360		B	P	LAF
	Cyanide				NR	

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

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EPA SAMPLE NO.

1

INORGANIC ANALYSIS DATA SHEET

MHP522

Lab Name: SILVER VALLEY LABS, INC. Contract: ~~68-03-0071~~ 68-W8-0094 MAB 10/04/89

Lab Code: SILVER Case No.: 12334 SAS No.: SDG No.: MHP520

Matrix (soil/water): WATER Lab Sample ID:

Level (low/med): LOW Date Received: 08/16/89

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	1740		B	P	LAF
7440-36-0	Antimony	53.8	B	WN	P	LAF
7440-38-2	Arsenic	41.9		N	F	MAB 09/08/89
7440-39-3	Barium	82.2	B	WB	P	LAF
7440-41-7	Beryllium	1.1	U		P	
7440-43-9	Cadmium	16.0		B	P	LAF
7440-70-2	Calcium	206000		B	P	LAF
7440-47-3	Chromium	2.8	U		P	
7440-48-4	Cobalt	5.7	B		P	LAF
7440-50-8	Copper	71.4		B	P	LAF
7439-89-6	Iron	5320		B	P	LAF
7439-92-1	Lead	1100		B	P	LAF
7439-95-4	Magnesium	42000		B	P	LAF
7439-96-5	Manganese	1220		B	P	LAF
7439-97-6	Mercury	2.2		N R	CV	MAB LAF 09/08/89
7440-02-0	Nickel	9.7	U		P	
7440-09-7	Potassium	3160	B		P	LAF
7782-49-2	Selenium	28.5	B	NW*	F	LAF
7440-22-4	Silver	6.3	B		P	LAF
7440-23-5	Sodium	42000		B	P	LAF
7440-28-0	Thallium	0.90	U		F	
7440-62-2	Vanadium	5.5	B		P	LAF
7440-66-6	Zinc	3790		B	P	LAF
	Cyanide				NR	

Color Before: BROWN Clarity Before: CLEAR Texture:

Color After: BROWN Clarity After: CLEAR Artifacts:

Comments:

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EPA SAMPLE NO.

1

INORGANIC ANALYSIS DATA SHEET

MHP523

Lab Name: SILVER VALLEY LABS, INC. Contract: ~~68-D9-0071~~ 68-D8-0074

Lab Code: SILVER Case No.: 12334 SAS No.: mb 10/02/89 SDG No.: MHP520

Matrix (soil/water): WATER Lab Sample ID:

Level (low/med): LOW Date Received: 08/16/89

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	[18.2]	B	uB	P	LAF
7440-36-0	Antimony	[25.7]	B	uB	P	LAF mb 09/08/89
7440-38-2	Arsenic	[6.6]	B	NW	F	
7440-39-3	Barium	[61.5]	B	uB	P	LAF
7440-41-7	Beryllium	1.1	U		P	
7440-43-9	Cadmium	[5.0]	B	uB	P	LAF
7440-70-2	Calcium	211000		B	P	LAF
7440-47-3	Chromium	2.8	U		P	
7440-48-4	Cobalt	[3.5]	B	uB	P	LAF
7440-50-8	Copper	[1.2]	B	uB	P	LAF
7439-89-6	Iron	[63.2]	B	uB	P	LAF
7439-92-1	Lead	48.3		N8* R	F	LAF mb 10/02/89
7439-95-4	Magnesium	41400		B	P	LAF
7439-96-5	Manganese	1170		B	P	LAF
7439-97-6	Mercury	0.20	U	N R	CV	LAF mb 09/08/89
7440-02-0	Nickel	[13.9]	B		P	LAF
7440-09-7	Potassium	[3180]	B	uB	P	LAF
7782-49-2	Selenium	[2.6]	B	N* uR	F	LAF
7440-22-4	Silver	1.6	U		P	
7440-23-5	Sodium	42300		B	P	LAF
7440-28-0	Thallium	0.90	U		F	
7440-62-2	Vanadium	2.7	U		P	
7440-66-6	Zinc	1730		B	P	LAF
	Cyanide				NR	

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MHP524

Lab Name: SILVER VALLEY LABS, INC. Contract: 68-W8-0074 ~~68-W9-0071~~ mab/10/02/89

Lab Code: SILVER Case No.: 12334 SAS No.: SDG No.: MHP520

Matrix (soil/water): WATER Lab Sample ID:

Level (low/med): LOW Date Received: 08/16/89

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	44500		B	P	LAF
7440-36-0	Antimony	210		B	P	LAF
7440-38-2	Arsenic	619			P	
7440-39-3	Barium	881		B	P	LAF
7440-41-7	Beryllium	[2.4]	B		P	
7440-43-9	Cadmium	137		B	P	LAF
7440-70-2	Calcium	248000		B	P	LAF
7440-47-3	Chromium	72.2			P	
7440-48-4	Cobalt	[27.0]	B	UB	P	LAF
7440-50-8	Copper	1390		B	P	LAF
7439-89-6	Iron	98500		B	P	LAF
7439-92-1	Lead	20000		J	P	LAF
7439-95-4	Magnesium	68400		B	P	LAF
7439-96-5	Manganese	3080		B	P	LAF
7439-97-6	Mercury	39.2		N R	CV	MAB LAF 09/08/89
7440-02-0	Nickel	67.3			P	
7440-09-7	Potassium	8980		B	P	LAF
7782-49-2	Selenium	[34.2]	B	N* UB	F	LAF
7440-22-4	Silver	131		B	P	LAF
7440-23-5	Sodium	42900		B	P	LAF
7440-28-0	Thallium	[4.7]	B	W	F	LAF
7440-62-2	Vanadium	129			P	
7440-66-6	Zinc	19300		B	P	LAF
	Cyanide				NR	

Color Before: BROWN Clarity Before: OPAQUE Texture:

Color After: BROWN Clarity After: OPAQUE Artifacts:

Comments:

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EPA SAMPLE NO.

1

INORGANIC ANALYSIS DATA SHEET

MHP525

Lab Name: SILVER VALLEY LABS, INC. Contract: ~~68-D9-0071~~ 68-W8-0074 MAB 10/04/89

Lab Code: SILVER Case No.: 12334 SAS No.: SDG No.: MHP520

Matrix (soil/water): WATER Lab Sample ID:

Level (low/med): LOW Date Received: 08/16/89

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	[27.9]	B	uB	P	LAF
7440-36-0	Antimony	19.9	U		P	
7440-38-2	Arsenic	[7.2]	B	~~N~~W	F	MAB 10/04/89
7440-39-3	Barium	[61.9]	B	uB	P	LAF
7440-41-7	Beryllium	1.1	U		P	
7440-43-9	Cadmium	1.8	U		P	
7440-70-2	Calcium	132000		B	P	LAF
7440-47-3	Chromium	2.8	U		P	
7440-48-4	Cobalt	[3.1]	B	uB	P	LAF
7440-50-8	Copper	1.1	U		P	
7439-89-6	Iron	[56.4]	B	uB	P	LAF
7439-92-1	Lead	9.2		~~NS~~ BJ	F	MAB 10/04/89
7439-95-4	Magnesium	34700		B	P	LAF
7439-96-5	Manganese	20.3		B	P	LAF
7439-97-6	Mercury	0.20	U	~~N~~ R	CV	MAB 10/04/89 LAF
7440-02-0	Nickel	9.7	U		P	
7440-09-7	Potassium	[1820]	B	uB	P	LAF
7782-49-2	Selenium	[15.4]	B	N* uB	F	LAF
7440-22-4	Silver	1.6	U		P	
7440-23-5	Sodium	19700			P	
7440-28-0	Thallium	0.90	U		F	
7440-62-2	Vanadium	2.7	U		P	
7440-66-6	Zinc	64.1		B	P	LAF
	Cyanide				NR	

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

U.S. EPA - CLP

EPA SAMPLE NO.

1

INORGANIC ANALYSIS DATA SHEET

MHP526

Lab Name: SILVER VALLEY LABS, INC. Contract: ~~68-D9-0071~~ 68-C8-0074 mhp 10/2/89

Lab Code: SILVER Case No.: 12334 SAS No.: SDG No.: MHP520

Matrix (soil/water): WATER Lab Sample ID:

Level (low/med): LOW Date Received: 08/16/89

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	[26.3]	B		P	LAF
7440-36-0	Antimony	19.9	U		P	
7440-38-2	Arsenic	[7.7]	B	NW	F	mhp 09/08/89
7440-39-3	Barium	[61.9]	B		P	LAF
7440-41-7	Beryllium	1.1	U		P	
7440-43-9	Cadmium	1.8	U		P	
7440-70-2	Calcium	131000			P	LAF
7440-47-3	Chromium	2.8	U		P	
7440-48-4	Cobalt	2.6	U		P	
7440-50-8	Copper	[2.4]	B		P	LAF
7439-89-6	Iron	[84.7]	B		P	LAF
7439-92-1	Lead	[0.93]	B	NW*	F	mhp 10/04/89 LAF
7439-95-4	Magnesium	34400			P	LAF
7439-96-5	Manganese	19.1			P	LAF
7439-97-6	Mercury	0.20	U	R	CV	mhp LAF 09/08/89
7440-02-0	Nickel	9.7	U		P	
7440-09-7	Potassium	[2110]	B		P	LAF
7782-49-2	Selenium	[5.2]	B	N*	F	LAF
7440-22-4	Silver	1.6	U		P	
7440-23-5	Sodium	19700			P	
7440-28-0	Thallium	0.90	U		F	
7440-62-2	Vanadium	2.7	U		P	
7440-66-6	Zinc	52.7			P	LAF
	Cyanide				NR	

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

U.S. EPA - CLP

EPA SAMPLE NO.

1

INORGANIC ANALYSIS DATA SHEET

MHP527

Lab Name: SILVER VALLEY LABS, INC. Contract: ~~68-D9-0071~~ 68-W8-0074

Lab Code: SILVER Case No.: 12334 SAS No.: MRB 10/02/89 SDG No.: MHP520

Matrix (soil/water): WATER Lab Sample ID:

Level (low/med): LOW Date Received: 08/16/89

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	43400		B	P	LAF
7440-36-0	Antimony	199		B	P	LAF
7440-38-2	Arsenic	540			P	
7440-39-3	Barium	788		B	P	LAF
7440-41-7	Beryllium	[2.1]	B		P	LAF
7440-43-9	Cadmium	127		B	P	LAF
7440-70-2	Calcium	246000		B	P	LAF
7440-47-3	Chromium	68.5			P	
7440-48-4	Cobalt	[28.4]	B	UB	P	LAF
7440-50-8	Copper	1260		B	P	LAF
7439-89-6	Iron	89300		B	P	LAF
7439-92-1	Lead	17900		S J	P	LAF
7439-95-4	Magnesium	67100		B	P	LAF
7439-96-5	Manganese	2950		B	P	LAF
7439-97-6	Mercury	36.0		N R	CV	MRB LAF 8/08/89
7440-02-0	Nickel	57.3			P	
7440-09-7	Potassium	8770		B	P	LAF
7782-49-2	Selenium	[43.9]	B	N* UB	F	LAF
7440-22-4	Silver	117		B	P	LAF
7440-23-5	Sodium	42700			P	
7440-28-0	Thallium	[4.2]	B	W	F	LAF
7440-62-2	Vanadium	121			P	
7440-66-6	Zinc	17700		B	P	LAF
	Cyanide				NR	

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

U.S. EPA - CLP

EPA SAMPLE NO.

1

INORGANIC ANALYSIS DATA SHEET

MHP528

Lab Name: SILVER VALLEY LABS, INC. Contract: 68-W8-0074

Lab Code: SILVER Case No.: 12334 SAS No.: SDG No.: MHP520

Matrix (soil/water): WATER Lab Sample ID:

Level (low/med): LOW Date Received: 08/16/89

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	[28.0]	B		P	
7440-36-0	Antimony	[26.9]	B		P	
7440-38-2	Arsenic	[5.6]	B	W	F	
7440-39-3	Barium	[60.8]	B		P	
7440-41-7	Beryllium	1.1	U		P	
7440-43-9	Cadmium	6.0		B	P	
7440-70-2	Calcium	211000		B	P	
7440-47-3	Chromium	2.8	U		P	
7440-48-4	Cobalt	[5.3]	B		P	
7440-50-8	Copper	[1.2]	B		P	
7439-89-6	Iron	[55.1]	B		P	
7439-92-1	Lead	34.6			F	
7439-95-4	Magnesium	41400			P	
7439-96-5	Manganese	1180			P	
7439-97-6	Mercury	0.20	U	R	CV	
7440-02-0	Nickel	9.7	U		P	
7440-09-7	Potassium	3060	B		P	
7782-49-2	Selenium	15.1	B	W*	F	
7440-22-4	Silver	1.6	U		P	
7440-23-5	Sodium	41200			P	
7440-28-0	Thallium	0.90	U		F	
7440-62-2	Vanadium	[3.8]	B		P	
7440-66-6	Zinc	1730		R	P	
	Cyanide				NR	

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

U.S. EPA - CLP

EPA SAMPLE NO.

1

INORGANIC ANALYSIS DATA SHEET

MHP529

Lab Name: SILVER VALLEY LABS, INC. Contract: ~~68-D9-0074~~ 68-W8-0074 MAB 10/02/89

Lab Code: SILVER Case No.: 12334 SAS No.: SDG No.: MHP520

Matrix (soil/water): WATER Lab Sample ID:

Level (low/med): LOW Date Received: 08/16/89

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	[24.9]	B	WB	P	LAF
7440-36-0	Antimony	19.9	U		P	
7440-38-2	Arsenic	2.3	U	N	F	MAB 09/08/89
7440-39-3	Barium	1.3	U		P	
7440-41-7	Beryllium	1.1	U		P	
7440-43-9	Cadmium	1.8	U		P	
7440-70-2	Calcium	[214]	B	WB	P	LAF
7440-47-3	Chromium	2.8	U		P	
7440-48-4	Cobalt	2.6	U		P	
7440-50-8	Copper	1.1	U		P	
7439-89-6	Iron	[64.2]	B	WB	P	LAF
7439-92-1	Lead	[1.8]	B	N WB	F	MAB 09/08/89 LAF
7439-95-4	Magnesium	[3.7]	B	WB	P	LAF
7439-96-5	Manganese	[1.4]	B	WB	P	LAF
7439-97-6	Mercury	0.20	U	N R	CV	MAB 09/08/89 LAF
7440-02-0	Nickel	9.7	U		P	
7440-09-7	Potassium	273	U		P	
7782-49-2	Selenium	1.2	U	NW*	F	LAF
7440-22-4	Silver	1.6	U		P	
7440-23-5	Sodium	[47.5]	B	WB	P	LAF
7440-28-0	Thallium	0.90	U		F	
7440-62-2	Vanadium	2.7	U		P	
7440-66-6	Zinc	[12.6]	B	WB	P	LAF
	Cyanide				NR	

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

U.S. EPA - CLP

EPA SAMPLE NO.

1

INORGANIC ANALYSIS DATA SHEET

MHP530

Lab Name: SILVER VALLEY LABS, INC. Contract: ~~68-D9-0071~~ 68-D8-0074 MAB 09/08/89

Lab Code: SILVER Case No.: 12334 SAS No.: SDG No.: MHP520

Matrix (soil/water): WATER Lab Sample ID:

Level (low/med): LOW Date Received: 08/16/89

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	[32.1]	B	LAB	P	LAF
7440-36-0	Antimony	19.9	U		P	
7440-38-2	Arsenic	2.3	U	N	F	MAB 09/08/89
7440-39-3	Barium	1.3	U		P	
7440-41-7	Beryllium	1.1	U		P	
7440-43-9	Cadmium	1.8	U		P	
7440-70-2	Calcium	[136]	B	LAB	P	LAF
7440-47-3	Chromium	2.8	U		P	
7440-48-4	Cobalt	2.6	U		P	
7440-50-8	Copper	1.1	U		P	
7439-89-6	Iron	[41.5]	B		P	LAF
7439-92-1	Lead	[1.6]	B	NW* LAB	F	MAB 10/24/89 LAF
7439-95-4	Magnesium	[29.0]	B	LAB	P	LAF
7439-96-5	Manganese	[2.5]	B	LAB	P	LAF
7439-97-6	Mercury	0.20	U	N R	CV	MAB LAF 09/08/89
7440-02-0	Nickel	9.7	U		P	
7440-09-7	Potassium	273	U		P	
7782-49-2	Selenium	1.2	U	N*	F	
7440-22-4	Silver	23.8		B	P	LAF
7440-23-5	Sodium	13.2	U		P	
7440-28-0	Thallium	0.90	U		F	
7440-62-2	Vanadium	2.7	U		P	
7440-66-6	Zinc	[6.5]	B	LAB	P	LAF
	Cyanide				NR	

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

U.S. EPA - CLP

EPA SAMPLE NO.

1

INORGANIC ANALYSIS DATA SHEET

MHP532

Lab Name: SILVER VALLEY LABS, INC. Contract: ~~68-D9-0071~~ 68-C8-0074 MAB 10/20/89

Lab Code: SILVER Case No.: 12334 SAS No.: SDG No.: MHP520

Matrix (soil/water): WATER Lab Sample ID:

Level (low/med): LOW Date Received: 08/16/89

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	[23.0]	B	UB	P	LAF
7440-36-0	Antimony	19.9	U		P	
7440-38-2	Arsenic	[2.9]	B	NW	F	LAF MAB 09/08/89
7440-39-3	Barium	[37.3]	B	UB	P	LAF
7440-41-7	Beryllium	1.1	U		P	
7440-43-9	Cadmium	1.8	U		P	
7440-70-2	Calcium	321000			P	
7440-47-3	Chromium	2.8	U		P	
7440-48-4	Cobalt	[6.3]	B	UB	P	LAF
7440-50-8	Copper	[1.2]	B	UB	P	LAF
7439-89-6	Iron	503		B	P	LAF
7439-92-1	Lead	0.90	U	NW*	F	MAB 09/08/89
7439-95-4	Magnesium	56100		B	P	LAF
7439-96-5	Manganese	[2]900		B	P	LAF
7439-97-6	Mercury	0.20	U	N	CV	LAF MAB 09/08/89
7440-02-0	Nickel	9.7	U		P	
7440-09-7	Potassium	5380			P	
7782-49-2	Selenium	12.0	U	NW*	F	LAF
7440-22-4	Silver	1.6	U		P	
7440-23-5	Sodium	60000		B	P	LAF
7440-28-0	Thallium	0.90	U		F	
7440-62-2	Vanadium	2.7	U		P	
7440-66-6	Zinc	[9.8]	B	UB	P	LAF
	Cyanide				NR	

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

U.S. EPA - CLP

1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MHP533

Lab Name: SILVER VALLEY LABS, INC. Contract: ~~68-D9-0071~~ 68-W8-0074

Lab Code: SILVER Case No.: 12334 SAS No.: SDG No.: MHP520

Matrix (soil/water): WATER Lab Sample ID:

Level (low/med): LOW Date Received: 08/16/89

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	317		B	P	LAF
7440-36-0	Antimony	19.9	U		P	
7440-38-2	Arsenic	33.1		NS	F	
7440-39-3	Barium	[82.2]	B	WB	P	
7440-41-7	Beryllium	1.1	U		P	
7440-43-9	Cadmium	[3.6]	B	WA	P	LAF
7440-70-2	Calcium	369000		B	P	LAF
7440-47-3	Chromium	2.8	U		P	
7440-48-4	Cobalt	[5.6]	B	WB	P	LAF
7440-50-8	Copper	[6.6]	B	WB	P	LAF
7439-89-6	Iron	10200		B	P	LAF
7439-92-1	Lead	68.2		N~~S~~ (B)	F	LAF
7439-95-4	Magnesium	58800		B	P	LAF
7439-96-5	Manganese	21400		B	P	LAF
7439-97-6	Mercury	0.20	U	R	CV	LAF
7440-02-0	Nickel	9.7	U		P	
7440-09-7	Potassium	9960			P	
7782-49-2	Selenium	[18.5]	B	NW* WB	F	LAF
7440-22-4	Silver	1.6	U		P	
7440-23-5	Sodium	63400		B	P	LAF
7440-28-0	Thallium	0.90	U		F	
7440-62-2	Vanadium	2.7	U		P	
7440-66-6	Zinc	759		B	P	LAF
	Cyanide				NR	

mnb 10/04/89

mnb 10/04/89

Color Before: YELLOW Clarity Before: CLOUDY Texture:

Color After: YELLOW Clarity After: CLOUDY Artifacts:

Comments:

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U.S. EPA - CLP

EPA SAMPLE NO.

1

INORGANIC ANALYSIS DATA SHEET

MHP534

Lab Name: SILVER VALLEY LABS, INC. Contract: ~~68-D9-0071~~ 68-W8-0074

Lab Code: SILVER Case No.: 12334 SAS No.: SDG No.: MHP520

Matrix (soil/water): WATER Lab Sample ID:

Level (low/med): LOW Date Received: 08/16/89

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	[44.6]	B	UB	P	LAF
7440-36-0	Antimony	[20.1]	B	UB	P	LAF
7440-38-2	Arsenic	2.3	U	NW	F	MRB 08/08/89
7440-39-3	Barium	[56.7]	B	UB	P	LAF
7440-41-7	Beryllium	1.1	U		P	
7440-43-9	Cadmium	10.3		R	P	LAF
7440-70-2	Calcium	205000		R	P	LAF
7440-47-3	Chromium	2.8	U		P	
7440-48-4	Cobalt	[3.1]	B	UB	P	LAF
7440-50-8	Copper	[2.7]	B	UB	P	LAF
7439-89-6	Iron	[31.5]	B	UB	P	LAF
7439-92-1	Lead	[1.4]	B	N UB J	F	MRB 08/08/89 LAF
7439-95-4	Magnesium	40400		B	P	LAF
7439-96-5	Manganese	1070		B	P	LAF
7439-97-6	Mercury	0.20	U	N R	CV	MRB 08/08/89 LAF
7440-02-0	Nickel	9.7	U		P	
7440-09-7	Potassium	[3180]	B	UB	P	LAF
7782-49-2	Selenium	[2.7]	B	N* UB	F	LAF
7440-22-4	Silver	1.6	U		P	
7440-23-5	Sodium	41900		B	P	LAF
7440-28-0	Thallium	0.90	U		F	
7440-62-2	Vanadium	2.7	U		P	
7440-66-6	Zinc	2970		B	P	LAF
	Cyanide				NR	

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

U.S. EPA - CLP

EPA SAMPLE NO.

1

INORGANIC ANALYSIS DATA SHEET

MHP535

Lab Name: SILVER VALLEY LABS, INC. Contract: ~~68-03-0071~~ 68-W8-0074 mnb 09/08/89

Lab Code: SILVER Case No.: 12334 SAS No.: SDG No.: MHP520

Matrix (soil/water): WATER Lab Sample ID:

Level (low/med): LOW Date Received: 08/16/89

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	[61.1]	B	WB	P	LAF
7440-36-0	Antimony	19.9	U		P	
7440-38-2	Arsenic	[5.6]	B	NW	F	mnb LAF 09/08/89
7440-39-3	Barium	[56.0]	B	WB	P	LAF
7440-41-7	Beryllium	1.1	U		P	
7440-43-9	Cadmium	10.3		B	P	LAF
7440-70-2	Calcium	205000		B	P	LAF
7440-47-3	Chromium	2.8	U		P	
7440-48-4	Cobalt	[3.5]	B	WB	P	LAF
7440-50-8	Copper	[4.9]	B	WB	P	LAF
7439-89-6	Iron	496		B	P	LAF
7439-92-1	Lead	25.2		~~NS~~ B	F	LAF
7439-95-4	Magnesium	40300		B	P	LAF
7439-96-5	Manganese	1080		B	P	LAF
7439-97-6	Mercury	0.20	U	NR	CV	mnb LAF 09/08/89
7440-02-0	Nickel	[10.6]	B		P	LAF
7440-09-7	Potassium	[3380]	B	WB	P	LAF
7782-49-2	Selenium	1.2	U	NW*	F	
7440-22-4	Silver	1.6	U		P	
7440-23-5	Sodium	41900			P	
7440-28-0	Thallium	0.90	U		F	
7440-62-2	Vanadium	2.7	U		P	
7440-66-6	Zinc	3130		B	P	LAF
	Cyanide				NR	

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

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U.S. EPA - CLP

EPA SAMPLE NO.

1

INORGANIC ANALYSIS DATA SHEET

MHP537

Lab Name: SILVER VALLEY LABS, INC. Contract: ~~68-D9-0071~~ 68-C8-0074

Lab Code: SILVER Case No.: 12334 SAS No.: MHP 10/20/89 SDG No.: MHP520

Matrix (soil/water): WATER Lab Sample ID:

Level (low/med): LOW Date Received: 08/16/89

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	[49.5]	B	uB	P	LAF
7440-36-0	Antimony	19.9	U		P	
7440-38-2	Arsenic	2.3	U	NW	F	
7440-39-3	Barium	[54.3]	B	uB	P	LAF
7440-41-7	Beryllium	1.1	U		P	
7440-43-9	Cadmium	13.3		B	P	LAF
7440-70-2	Calcium	228000		B	P	LAF
7440-47-3	Chromium	2.8	U		P	
7440-48-4	Cobalt	[6.6]	B	uB	P	LAF
7440-50-8	Copper	[3.9]	B	uB	P	LAF
7439-89-6	Iron	346		B	P	LAF
7439-92-1	Lead	8.8		~~N~~ B	F	
7439-95-4	Magnesium	41800		B	P	LAF
7439-96-5	Manganese	1380		B	P	LAF
7439-97-6	Mercury	0.20	U	N R	CV	LAF
7440-02-0	Nickel	9.7	U		P	
7440-09-7	Potassium	[3630]	B	uB	P	LAF
7782-49-2	Selenium	[20.0]	B	NW* uB	F	LAF
7440-22-4	Silver	1.6	U		P	
7440-23-5	Sodium	48000		B	P	LAF
7440-28-0	Thallium	0.90	U		F	
7440-62-2	Vanadium	2.7	U		P	
7440-66-6	Zinc	3880		B	P	LAF
	Cyanide				NR	

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

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U.S. EPA - CLP

EPA SAMPLE NO.

1

INORGANIC ANALYSIS DATA SHEET | MHP539

Lab Name: SILVER VALLEY LABS, INC. Contract: ~~68-D9-0071~~ 68-W8-0074

Lab Code: SILVER Case No.: 12334 SAS No.: MAB 10/03/89 SDG No.: MHP520

Matrix (soil/water): WATER Lab Sample ID:

Level (low/med): LOW Date Received: 08/16/89

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	[29.0]	B	UB	P
7440-36-0	Antimony	19.9	U		P
7440-38-2	Arsenic	2.3	U	N	F
7440-39-3	Barium	[1.7]	B	UB	P
7440-41-7	Beryllium	1.1	U		P
7440-43-9	Cadmium	1.8	U		P
7440-70-2	Calcium	[109]	B	UB	P
7440-47-3	Chromium	2.8	U		P
7440-48-4	Cobalt	2.6	U		P
7440-50-8	Copper	1.1	U		P
7439-89-6	Iron	[33.4]	B	UB	P
7439-92-1	Lead	[1.3]	B	NW* UB	F
7439-95-4	Magnesium	[38.6]	B	UB	P
7439-96-5	Manganese	[2.0]	B	UB	P
7439-97-6	Mercury	0.20	U	N R	CV
7440-02-0	Nickel	9.7	U		P
7440-09-7	Potassium	273	U		P
7782-49-2	Selenium	1.2	U	N*	F
7440-22-4	Silver	1.6	U		P
7440-23-5	Sodium	[41.8]	B	UB	P
7440-28-0	Thallium	0.90	U		F
7440-62-2	Vanadium	2.7	U		P
7440-66-6	Zinc	[2.9]	B	UB	P
	Cyanide				NR

MAB 09/08/89

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

U.S. EPA - CLP

EPA SAMPLE NO.

1

INORGANIC ANALYSIS DATA SHEET

MHP538

Lab Name: SILVER VALLEY LABS, INC. Contract: ~~68-B9-0071~~ 68-W8-0094

Lab Code: SILVER Case No.: 12334 SAS No.: mhp 08/07/89 SDG No.: MHP520

Matrix (soil/water): WATER Lab Sample ID:

Level (low/med): LOW Date Received: 08/16/89

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	29.6	B		P	LAF
7440-36-0	Antimony	20.1	B		P	LAF
7440-38-2	Arsenic	2.3	U	NW	F	mhp 08/07/89
7440-39-3	Barium	51.1	B		P	LAF
7440-41-7	Beryllium	1.1	U		P	
7440-43-9	Cadmium	13.5			P	LAF
7440-70-2	Calcium	218000			P	LAF
7440-47-3	Chromium	2.8	U		P	
7440-48-4	Cobalt	[5.3]	B		P	LAF
7440-50-8	Copper	[1.5]	B		P	LAF
7439-89-6	Iron	[43.7]	B		P	LAF
7439-92-1	Lead	0.90	U	NW*	F	mhp 08/07/89
7439-95-4	Magnesium	39900			P	LAF
7439-96-5	Manganese	1330			P	LAF
7439-97-6	Mercury	0.20	U	NR	CV	mhp 08/07/89 LAF
7440-02-0	Nickel	9.7	U		P	
7440-09-7	Potassium	3570	B		P	LAF
7782-49-2	Selenium	18.0	B	NW*	F	LAF
7440-22-4	Silver	1.6	U		P	
7440-23-5	Sodium	46400			P	LAF
7440-28-0	Thallium	0.90	U		F	
7440-62-2	Vanadium	2.7	U		P	
7440-66-6	Zinc	3720			P	LAF
	Cyanide				NR	

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

U.S. EPA - CLP

EPA SAMPLE NO.

1

INORGANIC ANALYSIS DATA SHEET

MHP540

Lab Name: SILVER VALLEY LABS, INC. Contract: 68-W8-0074 ~~EB-D8-0074~~

Lab Code: SILVER Case No.: 12334 SAS No.: mhb 09/08/89 SDG No.: MHP520

Matrix (soil/water): WATER Lab Sample ID:

Level (low/med): LOW Date Received: 08/16/89

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	[27.0]	B	WB	P	LAF
7440-36-0	Antimony	19.9	U		P	
7440-38-2	Arsenic	2.3	U	NW	F	mhb 09/08/89
7440-39-3	Barium	1.3	U		P	
7440-41-7	Beryllium	1.1	U		P	
7440-43-9	Cadmium	1.8	U		P	
7440-70-2	Calcium	[90.8]	B	WB	P	LAF
7440-47-3	Chromium	2.8	U		P	
7440-48-4	Cobalt	[2.7]	B	WB	P	LAF
7440-50-8	Copper	1.1	U		P	
7439-89-6	Iron	[32.2]	B	WB	P	LAF
7439-92-1	Lead	0.90	U	NW	F	mhb 09/08/89
7439-95-4	Magnesium	[27.8]	B	WB	P	LAF
7439-96-5	Manganese	[1.4]	B	WB	P	LAF
7439-97-6	Mercury	0.20	U	R	CV	mhb 09/08/89 LAF
7440-02-0	Nickel	9.7	U		P	
7440-09-7	Potassium	[437]	B	WB	P	LAF
7782-49-2	Selenium	1.2	U	NW*	F	LAF
7440-22-4	Silver	1.6	U		P	
7440-23-5	Sodium	[13.3]	B	WB	P	LAF
7440-28-0	Thallium	0.90	U		F	
7440-62-2	Vanadium	2.7	U		P	
7440-66-6	Zinc	1.3	U		P	
	Cyanide				NR	

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

REGION VIII SUMMARY OF DATA QUALITY ASSURANCE REVIEW

*****guideline references are from Contract #787*****

Case No.: 12334 **TDD No.:** F08-8909-08

Site: Richardson Flats

Contractor Laboratory: Keystone-Houston

Data Reviewer : Annette Sackman **Date of Review:** 10-3-89

Sample Matrix: 19 Low Waters

Analysis: Mercury

Sample Nos.: MHP520, MHP521, MHP522, MHP523, MHP524, MHP525, MHP526, MHP527, MHP528, MHP529, MHP530, MHP532, MHP533, MHP534, MHP535, MHP537, MHP538, MHP539, MHP540

(X) Data are acceptable for use.

( ) Data are acceptable for use with qualifications noted.

( ) Data are preliminary - pending verification.

( ) Data are unacceptable.

Action required by DPO?

No X Yes The following items require action:

Action required by project officer?

No X Yes

The following are our findings:

All requirements were met for the mercury analysis except Form VII - Laboratory Control Sample was not included. Since the LCS was analyzed and reported in the raw data and met all other requirements, no action is taken.

Inorganic Data Completeness Checklist

X	Inorganic analysis data (Form I)
X	Initial calibration and continuing calibration verification (Form IIA)
-	CRDL standard for AA and ICP (Form IIB)
X	Blanks (Form III)
	ICP interference Check sample (Form IV)
X	Spike sample recovery (Form VA)
	Post digestion spike sample recovery (Form VB)
X	Duplicates (Form VI)
X	Laboratory control sample (Form VII)
	Standard addition results (Form VIII)
	ICP serial dilutions (Form IX)
X	Holding times (Form X)
X	Instrument detection limits-quarterly (Form XI)
X	ICP interelement correction factors-quarterly (Form II)
X	ICP linear ranges-quarterly (Form XIII)
	Raw data for interference checks
X	Raw data for calibration standards
X	Raw data for blanks
	Raw data for CRI and/or CRA
X	Raw data for samples
X	Raw data for duplicates
X	Raw data for spikes
X	Traffic reports

Contract Compliance

I. Initial and Continuing Calibration Verification (ICV and CCV) (guidelines pg. E-4, Form IIA)

1. **Was instrument calibrated daily and each time it was set up?**
   yes X no

2. **Were instruments calibrated using 1 blank and several standards?**
   yes X no

3. **Were calibration verifications within 90-110%?**
   yes X no

4. **Were continuing calibrations run at 10% frequency?**
   yes X no

5. **Were the raw data correctly transcribed onto Form IIA?**
   yes X no

Comments: All requirements met.

II. CRDL Standards for ICP (CRI) and/or AA (CRA) (guidelines pg. E-6, Form IIB)

1. For ICP analysis, were standards (CRI) @ 2x the CRDL or the IDL (whichever was greater) analyzed at the beginning and the end of each sample run, or at a minimum of twice/8 hour shift, whichever was more frequent?
   yes no

2. For furnace AA analysis, were standards (CRA) analyzed at the beginning and the end of each sample run, or at a minimum of twice/8 hour shift, whichever was more frequent?
   yes no

3. Were the CRI and/or CRA standards analyzed after the ICV?
   yes no

4. Were these data reported on Form IIB?
   yes no

5. Were the raw data correctly transcribed onto Form IIB?
   yes no

Comments: Not required.

III. **Blanks (guidelines pg. E-6, Form III)**

1. Was the initial calibration blank (ICB) analyzed immediately after the initial calibration verification (ICV)?
   yes X no

2. Was a continuing calibration blank (CCB) analyzed immediately after each continuing calibration verification (CCV)?
   yes X no

3. Was a preparation blank (PB) analyzed at a frequency of at least 1 in 20 samples?
   yes X no NA

4. How many elements were detected above the CRDLs? 0 (if 0, go to question 5)

   4a. How many elements were detected in the blanks at greater than one-half the amount detected in any sample?

5. Were raw data correctly transcribed onto Form III?
   yes X no

Comments: All requirements met.

IV. **ICP Interference Checks (ICS) (guidelines pg. E-7, Form IV)**

1. Was the ICS analyzed twice per 8 hour shift?
   yes no

2. Were the ICSs analyzed before and after samples?
   yes no

3. Was any massive interference detected?
   yes no

4. Were the ICSs within ±20% mean value?
   yes no

5. Were raw data correctly transcribed onto Form IV?

Comments: Not required.

V. Spike Sample Analysis (S) (guideline pg. E-8, Form V)

1. Were spikes analyzed at a frequency of 1 in 20 samples?
   yes X no

2. Were spike recoveries correctly calculated?
   yes X no

$$\% \text{ recovery} = \frac{(SSR - SR)}{SA} \times 100$$

SSR = Spiked Sample Result
SR = Sample Result
SA = Spike Added

3. Were spike recoveries within the range of 75-125%?
   yes X no

3a. For recoveries outside this range, were associated data flagged "N" by the laboratory on Forms I and V?
   yes no NA X

(an exception if granted where the sample concentration is >4X the spike concentration)

4. Were raw data correctly transcribed onto Form V?
   yes X no

* Refer to page E-9 (SOW 787) for information regarding the amount of spike to be added for each analyte and for other information about the Spike Sample Analysis.

Comments: All requirements met.

VI. Duplicates (D) (guidelines pg. E-11, Form VI)

1. Were duplicates analyzed at a frequency of 1 in 20 samples?
   yes X no

2. Were RPDs correctly calculated?
   yes X no

$$RPD = \frac{S - D}{(S + D)/2} \times 100$$

S = Sample
D = Duplicate

3a. For sample concentrations >5x the CRDL, were RPDs ±20%? (limits of ±35% apply for soil/sediment/tailings samples)

yes X no NA

3b. For sample concentrations >5x the CRDL, did duplicate analysis results fall outside the control window of ± the CRDL?

yes no X NA

3c. Where the RPDs exceeded the control limits, were the data flagged '*' on Forms I and VI by the laboratory?

yes no NA

4. Were raw data correctly transcribed onto Form VI?

yes X no

* Other Considerations:
- Field blanks cannot be used for duplicate analyses
- Duplicates must be analyzed for each analytical method

Comments: All requirements met.

VII. Laboratory Control Sample (LCS) Analysis (guideline pg. E-12, Form VII)

1. Was an LCS analyzed for every sample delivery group or batch of samples, whichever was more frequent?

yes X no

2. Were recoveries within the 80-120% limit?

yes X no

-if the recoveries were outside this range the analysis must be terminated, the problem corrected and the previous samples associated with that LCS redigested and reanalyzed.

3. Were the raw data correctly transcribed onto Form VII?

yes no X

Comments: Form VII was not included in the data package, however, the LCS was analyzed and met contract requirements, therefore, no action is taken.

VIII. Furnace Atomic Absorption (AA) QC Analysis (guidelines pg. E-14, Form VIII)

1. Does the rav data package contain absorbance values for two injections per sample, the average values and the relative standard deviation (RSD)?

   yes no

2. For analyte concentrations > the CRDL, did the RSD for the duplicate injections agree within 20%? (if yes, go to question 3)

   yes no

   $$RSD = \frac{SD}{M} \times 100$$

   SD = Standard Deviation of Duplicate Injections
   M = Mean of Duplicate Injections

   2a. Were samples that exceeded the 20% criteria reanalyzed?

   yes no

   2b. Did any reanalyzed samples exceed the 20% criteria?

   yes no

   2c. If yes, did the laboratory flag the data of Form I with an 'M'?

   yes no

3. Was the recovery of the spike > 40%? (if yes, go to question 4).

   yes no

   If no, was the sample diluted and rerun with another spike?

   yes no

4. Was sample absorbance 50% of spike absorbance?* (if yes, go to question 5).

   yes no

* Spike absorbance = absorbance of spiked sample - absorbance of sample.

4a. For spike recoveries between 85 and 115%, were results reported to the IDL?

yes no

$$RPD = \frac{(SSR - SR)}{SA} \times 100$$

SSR = Spike Sample Recovery
SR = Sample Result
SA = Spike Added

4b. For spike recoveries outside the 85 and 115% range, were results reported to the IDL and flagged with 'W'?

yes no

5. Was spike recovery between 85 and 115%? (if no, go to question 6)

5a. Were results quantified from calibration curve and reported to IDL?

yes no

6. Was an MSA at 50, 100 and 150% of the sample absorbance analyzed?

yes no

6a. Was each MSA analysis identified in the raw data along with the slope, intercept and correlation coefficient?

yes no

6b. Were these data correctly transcribed onto Form VIII?

yes no

6c. Were correlation coefficients(r) > 0.995?

yes no

6d. If no, were MSAs run once more?

yes no

- If the correlation coefficients were still > 0.995, data on Form I must be from the run with the best 'r' and the data on Forms I and VII must be flagged with a '+'.

Were these criteria met?

yes no

6e. Were all MSA obtained data marked with an 'S' or an S+ on form I?

yes no

Comments: Not required.

IX. ICP Serial Dilution (L) Analysis (guidelines pg. E-12, Form IX)

1. Was an ICP serial dilution performed on each group of samples of a similar matrix (i.e., soil, water) and concentration (i.e., low, high) or for each sample delivery group, whichever was more frequent?

   yes no

2. For elements with concentrations >10X the CRDL, did any exceed the serial dilution results by more than 10%? (if no, skip questions 3 and 4)

   yes no

   $$\% \text{ difference} = \frac{I - S}{I} \times 100$$

   I = Initial Sample Result
   S = Serial Dilution Result (instrument reading X5)

3. Which elements had concentrations that exceeded the 10% criteria?

4. Did the laboratory flag these data with an 'E' on Form IX?

   yes no

5. Were the raw data correctly transcribed onto Form IX?

   yes no

Comments: Not required.

X. **Instrument Detection Limits (IDL) (guidelines pg. E-13, Form XI)**

1. Were IDLs reported for each analyzed element?
   yes X no

2. Were IDLs reported for each instrument used?
   yes X no

3. Did the IDLs meet the contract requirements? (refer to pg. E-13, SOW 787)
   yes X no

Comments: All requirements met.

XI. **Interelement Corrections for ICP (guidelines pg. E-13, Form XII)**

1. Were correction factors reported on Form XII?
   yes X no

Comments: All requirements met.

XII. **Linear Range Analysis (LRA) (guidelines pg. E-14, Form XII)**

1. Was a linear range verification standard analyzed?
   yes X no

2. Was the results within ±5% of the true value?
   yes no

Holding Times

Limits: Metals - 6 months; Hg - 30 days; Cn - 28 days.

1. Verified date of sample receipt by laboratory 7-21-89
2. Date of preparation/analyses 8-3-89
3. Were holding times met? yes X no

Analyte	Matrix	Date Sampled	Prep Date	Holding Time	Holding Time Limit	Met
Mercury	Low Water	7-18-89	8-3-89	16 days	30 days	yes

Keystone 12334-8-5

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MHP520

Lab Name: KEYSTONE ENVIRONMENTAL Contract: 68-W8-0005

Lab Code: KEYTX Case No.: 12334 SAS No.: SDG No.: MHP520

Matrix (soil/water): WATER Lab Sample ID: 890774002

Level (low/med): LOW Date Received: 07/21/89

% Solids: 0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony				NR
7440-38-2	Arsenic				NR
7440-39-3	Barium				NR
7440-41-7	Beryllium				NR
7440-43-9	Cadmium				NR
7440-70-2	Calcium				NR
7440-47-3	Chromium				NR
7440-48-4	Cobalt				NR
7440-50-8	Copper				NR
7439-89-6	Iron				NR
7439-92-1	Lead				NR
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	0.20	U		CV
7439-02-0	Nickel				NR
7440-09-7	Potassium				NR
7782-49-2	Selenium				NR
7440-22-4	Silver				NR
7440-23-5	Sodium				NR
7440-28-0	Thallium				NR
7440-62-2	Vanadium				NR
7440-66-6	Zinc				NR
	Cyanide				NR

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments:

600007

Keystone 12334-8-5

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1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MHP521

Lab Name: KEYSTONE ENVIRONMENTAL Contract: 68-W8-0005

Lab Code: KEYTX Case No.: 12334 SAS No.: SDG No.: MHP520

Matrix (soil/water): WATER Lab Sample ID: 890774005

Level (low/med): LOW Date Received: 07/21/89

% Solids: 0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony				NR
7440-38-2	Arsenic				NR
7440-39-3	Barium				NR
7440-41-7	Beryllium				NR
7440-43-9	Cadmium				NR
7440-70-2	Calcium				NR
7440-47-3	Chromium				NR
7440-48-4	Cobalt				NR
7440-50-8	Copper				NR
7439-89-6	Iron				NR
7439-92-1	Lead				NR
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	0.20	U		CV
7439-02-0	Nickel				NR
7440-09-7	Potassium				NR
7782-49-2	Selenium				NR
7440-22-4	Silver				NR
7440-23-5	Sodium				NR
7440-28-0	Thallium				NR
7440-62-2	Vanadium				NR
7440-66-6	Zinc				NR
	Cyanide				NR

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments:

600008

Keystone 12334-8-5

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1
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.
MHP522

Lab Name: KEYSTONE ENVIRONMENTAL Contract: 68-W8-0005

Lab Code: KEYTX Case No.: 12334 SAS No.: SDG No.: MHP520

Matrix (soil/water): WATER Lab Sample ID: 890774006

Level (low/med): LOW Date Received: 07/21/89

% Solids: 0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony				NR
7440-38-2	Arsenic				NR
7440-39-3	Barium				NR
7440-41-7	Beryllium				NR
7440-43-9	Cadmium				NR
7440-70-2	Calcium				NR
7440-47-3	Chromium				NR
7440-48-4	Cobalt				NR
7440-50-8	Copper				NR
7439-89-6	Iron				NR
7439-92-1	Lead				NR
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	0.20	U		CV
7439-02-0	Nickel				NR
7440-09-7	Potassium				NR
7782-49-2	Selenium				NR
7440-22-4	Silver				NR
7440-23-5	Sodium				NR
7440-28-0	Thallium				NR
7440-62-2	Vanadium				NR
7440-66-6	Zinc				NR
	Cyanide				NR

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments:

000009

Keystone DCN 12334-8-5

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1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MHP523

Lab Name: KEYSTONE ENVIRONMENTAL Contract: 68-W8-0005

Lab Code: KEYTX Case No.: 12334 SAS No.: SDG No.: MHP520

Matrix (soil/water): WATER Lab Sample ID: 890774007

Level (low/med): LOW Date Received: 07/21/89

% Solids: 0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony				NR
7440-38-2	Arsenic				NR
7440-39-3	Barium				NR
7440-41-7	Beryllium				NR
7440-43-9	Cadmium				NR
7440-70-2	Calcium				NR
7440-47-3	Chromium				NR
7440-48-4	Cobalt				NR
7440-50-8	Copper				NR
7439-89-6	Iron				NR
7439-92-1	Lead				NR
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	0.20	U		CV
7439-02-0	Nickel				NR
7440-09-7	Potassium				NR
7782-49-2	Selenium				NR
7440-22-4	Silver				NR
7440-23-5	Sodium				NR
7440-28-0	Thallium				NR
7440-62-2	Vanadium				NR
7440-66-6	Zinc				NR
	Cyanide				NR

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments:

Keystone D/# 12334-8-5

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MHP524

Lab Name: KEYSTONE ENVIRONMENTAL Contract: 68-W8-0005

Lab Code: KEYTX Case No.: 12334 SAS No.: SDG No.: MHP520

Matrix (soil/water): WATER Lab Sample ID: 890774008

Level (low/med): LOW Date Received: 07/21/89

% Solids: 0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony				NR
7440-38-2	Arsenic				NR
7440-39-3	Barium				NR
7440-41-7	Beryllium				NR
7440-43-9	Cadmium				NR
7440-70-2	Calcium				NR
7440-47-3	Chromium				NR
7440-48-4	Cobalt				NR
7440-50-8	Copper				NR
7439-89-6	Iron				NR
7439-92-1	Lead				NR
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	11.50			CV
7439-02-0	Nickel				NR
7440-09-7	Potassium				NR
7782-49-2	Selenium				NR
7440-22-4	Silver				NR
7440-23-5	Sodium				NR
7440-28-0	Thallium				NR
7440-62-2	Vanadium				NR
7440-66-6	Zinc				NR
	Cyanide				NR

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments:

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Keystone 12334-8-5

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MHP525

Lab Name: KEYSTONE ENVIRONMENTAL Contract: 68-W8-0005

Lab Code: KEYTX Case No.: 12334 SAS No.: SDG No.: MHP520

Matrix (soil/water): WATER Lab Sample ID: 890774009

Level (low/med): LOW Date Received: 07/21/89

% Solids: 0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony				NR
7440-38-2	Arsenic				NR
7440-39-3	Barium				NR
7440-41-7	Beryllium				NR
7440-43-9	Cadmium				NR
7440-70-2	Calcium				NR
7440-47-3	Chromium				NR
7440-48-4	Cobalt				NR
7440-50-8	Copper				NR
7439-89-6	Iron				NR
7439-92-1	Lead				NR
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	0.20	U		CV
7439-02-0	Nickel				NR
7440-09-7	Potassium				NR
7782-49-2	Selenium				NR
7440-22-4	Silver				NR
7440-23-5	Sodium				NR
7440-28-0	Thallium				NR
7440-62-2	Vanadium				NR
7440-66-6	Zinc				NR
	Cyanide				NR

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments:

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1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MHP526

Lab Name: KEYSTONE ENVIRONMENTAL Contract: 68-W8-0005

Lab Code: KEYTX Case No.: 12334 SAS No.: SDG No.: MHP520

Matrix (soil/water): WATER Lab Sample ID: 890774010

Level (low/med): LOW Date Received: 07/21/89

% Solids: 0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony				NR
7440-38-2	Arsenic				NR
7440-39-3	Barium				NR
7440-41-7	Beryllium				NR
7440-43-9	Cadmium				NR
7440-70-2	Calcium				NR
7440-47-3	Chromium				NR
7440-48-4	Cobalt				NR
7440-50-8	Copper				NR
7439-89-6	Iron				NR
7439-92-1	Lead				NR
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	0.20	U		CV
7439-02-0	Nickel				NR
7440-09-7	Potassium				NR
7782-49-2	Selenium				NR
7440-22-4	Silver				NR
7440-23-5	Sodium				NR
7440-28-0	Thallium				NR
7440-62-2	Vanadium				NR
7440-66-6	Zinc				NR
	Cyanide				NR

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments:

U.S. EPA - CLP

1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MHP527

Lab Name: KEYSTONE ENVIRONMENTAL Contract: 68-W8-0005

Lab Code: KEYTX Case No.: 12334 SAS No.: SDG No.: MHP520

Matrix (soil/water): WATER Lab Sample ID: 890774011

Level (low/med): LOW Date Received: 07/21/89

% Solids: 0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony				NR
7440-38-2	Arsenic				NR
7440-39-3	Barium				NR
7440-41-7	Beryllium				NR
7440-43-9	Cadmium				NR
7440-70-2	Calcium				NR
7440-47-3	Chromium				NR
7440-48-4	Cobalt				NR
7440-50-8	Copper				NR
7439-89-6	Iron				NR
7439-92-1	Lead				NR
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	8.50			CV
7439-02-0	Nickel				NR
7440-09-7	Potassium				NR
7782-49-2	Selenium				NR
7440-22-4	Silver				NR
7440-23-5	Sodium				NR
7440-28-0	Thallium				NR
7440-62-2	Vanadium				NR
7440-66-6	Zinc				NR
	Cyanide				NR

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments:

U.S. EPA - CLP

1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MHP528

Lab Name: KEYSTONE ENVIRONMENTAL Contract: 68-W8-0005

Lab Code: KEYTX Case No.: 12334 SAS No.: SDG No.: MHP520

Matrix (soil/water): WATER Lab Sample ID: 890774012

Level (low/med): LOW Date Received: 07/21/89

% Solids: 0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony				NR
7440-38-2	Arsenic				NR
7440-39-3	Barium				NR
7440-41-7	Beryllium				NR
7440-43-9	Cadmium				NR
7440-70-2	Calcium				NR
7440-47-3	Chromium				NR
7440-48-4	Cobalt				NR
7440-50-8	Copper				NR
7439-89-6	Iron				NR
7439-92-1	Lead				NR
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	0.20	U		CV
7439-02-0	Nickel				NR
7440-09-7	Potassium				NR
7782-49-2	Selenium				NR
7440-22-4	Silver				NR
7440-23-5	Sodium				NR
7440-28-0	Thallium				NR
7440-62-2	Vanadium				NR
7440-66-6	Zinc				NR
	Cyanide				NR

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments:

000015

Keystone 12334-8-5

U.S. EPA - CLP

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MHP529

Lab Name: KEYSTONE ENVIRONMENTAL Contract: 68-W8-0005

Lab Code: KEYTX Case No.: 12334 SAS No.: SDG No.: MHP520

Matrix (soil/water): WATER Lab Sample ID: 890774013

Level (low/med): LOW Date Received: 07/21/89

% Solids: 0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony				NR
7440-38-2	Arsenic				NR
7440-39-3	Barium				NR
7440-41-7	Beryllium				NR
7440-43-9	Cadmium				NR
7440-70-2	Calcium				NR
7440-47-3	Chromium				NR
7440-48-4	Cobalt				NR
7440-50-8	Copper				NR
7439-89-6	Iron				NR
7439-92-1	Lead				NR
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	0.20	U		CV
7439-02-0	Nickel				NR
7440-09-7	Potassium				NR
7782-49-2	Selenium				NR
7440-22-4	Silver				NR
7440-23-5	Sodium				NR
7440-28-0	Thallium				NR
7440-62-2	Vanadium				NR
7440-66-6	Zinc				NR
	Cyanide				NR

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments:

000016

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1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.
MHP530

Lab Name: KEYSTONE ENVIRONMENTAL Contract: 68-W8-0005

Lab Code: KEYTX Case No.: 12334 SAS No.: SDG No.: MHP520

Matrix (soil/water): WATER Lab Sample ID: 890774014

Level (low/med): LOW Date Received: 07/21/89

% Solids: 0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony				NR
7440-38-2	Arsenic				NR
7440-39-3	Barium				NR
7440-41-7	Beryllium				NR
7440-43-9	Cadmium				NR
7440-70-2	Calcium				NR
7440-47-3	Chromium				NR
7440-48-4	Cobalt				NR
7440-50-8	Copper				NR
7439-89-6	Iron				NR
7439-92-1	Lead				NR
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	0.20	U		CV
7439-02-0	Nickel				NR
7440-09-7	Potassium				NR
7782-49-2	Selenium				NR
7440-22-4	Silver				NR
7440-23-5	Sodium				NR
7440-28-0	Thallium				NR
7440-62-2	Vanadium				NR
7440-66-6	Zinc				NR
	Cyanide				NR

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments:

Keystone DC# 12334-8-5

U.S. EPA - CLP

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MHP532

Lab Name: KEYSTONE ENVIRONMENTAL Contract: 68-W8-0005

Lab Code: KEYTX Case No.: 12334 SAS No.: SDG No.: MHP520

Matrix (soil/water): WATER Lab Sample ID: 890774015

Level (low/med): LOW Date Received: 07/21/89

% Solids: 0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony				NR
7440-38-2	Arsenic				NR
7440-39-3	Barium				NR
7440-41-7	Beryllium				NR
7440-43-9	Cadmium				NR
7440-70-2	Calcium				NR
7440-47-3	Chromium				NR
7440-48-4	Cobalt				NR
7440-50-8	Copper				NR
7439-89-6	Iron				NR
7439-92-1	Lead				NR
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	0.20	U		CV
7439-02-0	Nickel				NR
7440-09-7	Potassium				NR
7782-49-2	Selenium				NR
7440-22-4	Silver				NR
7440-23-5	Sodium				NR
7440-28-0	Thallium				NR
7440-62-2	Vanadium				NR
7440-66-6	Zinc				NR
	Cyanide				NR

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments:

Keystone DC# 12334-8-5

U.S. EPA - CLP

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MHP533

Lab Name: KEYSTONE ENVIRONMENTAL Contract: 68-W8-0005

Lab Code: KEYTX Case No.: 12334 SAS No.: SDG No.: MHP520

Matrix (soil/water): WATER Lab Sample ID: 890774016

Level (low/med): LOW Date Received: 07/21/89

% Solids: 0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony				NR
7440-38-2	Arsenic				NR
7440-39-3	Barium				NR
7440-41-7	Beryllium				NR
7440-43-9	Cadmium				NR
7440-70-2	Calcium				NR
7440-47-3	Chromium				NR
7440-48-4	Cobalt				NR
7440-50-8	Copper				NR
7439-89-6	Iron				NR
7439-92-1	Lead				NR
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	0.20	U		CV
7439-02-0	Nickel				NR
7440-09-7	Potassium				NR
7782-49-2	Selenium				NR
7440-22-4	Silver				NR
7440-23-5	Sodium				NR
7440-28-0	Thallium				NR
7440-62-2	Vanadium				NR
7440-66-6	Zinc				NR
	Cyanide				NR

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments:

000019

Keystone DC# 12334-8-5

U.S. EPA - CLP

1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MHP534

Lab Name: KEYSTONE ENVIRONMENTAL Contract: 68-W8-0005

Lab Code: KEYTX Case No.: 12334 SAS No.: SDG No.: MHP520

Matrix (soil/water): WATER Lab Sample ID: 890774017

Level (low/med): LOW Date Received: 07/21/89

% Solids: 0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony				NR
7440-38-2	Arsenic				NR
7440-39-3	Barium				NR
7440-41-7	Beryllium				NR
7440-43-9	Cadmium				NR
7440-70-2	Calcium				NR
7440-47-3	Chromium				NR
7440-48-4	Cobalt				NR
7440-50-8	Copper				NR
7439-89-6	Iron				NR
7439-92-1	Lead				NR
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	0.20	U		CV
7439-02-0	Nickel				NR
7440-09-7	Potassium				NR
7782-49-2	Selenium				NR
7440-22-4	Silver				NR
7440-23-5	Sodium				NR
7440-28-0	Thallium				NR
7440-62-2	Vanadium				NR
7440-66-6	Zinc				NR
	Cyanide				NR

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments:

000020

Keystone DC# 12334-8-5

U.S. EPA - CLP

1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MHP535

Lab Name: KEYSTONE ENVIRONMENTAL Contract: 68-W8-0005

Lab Code: KEYTX Case No.: 12334 SAS No.: SDG No.: MHP520

Matrix (soil/water): WATER Lab Sample ID: 890774018

Level (low/med): LOW Date Received: 07/21/89

% Solids: 0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony				NR
7440-38-2	Arsenic				NR
7440-39-3	Barium				NR
7440-41-7	Beryllium				NR
7440-43-9	Cadmium				NR
7440-70-2	Calcium				NR
7440-47-3	Chromium				NR
7440-48-4	Cobalt				NR
7440-50-8	Copper				NR
7439-89-6	Iron				NR
7439-92-1	Lead				NR
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	0.20	U		CV
7439-02-0	Nickel				NR
7440-09-7	Potassium				NR
7782-49-2	Selenium				NR
7440-22-4	Silver				NR
7440-23-5	Sodium				NR
7440-28-0	Thallium				NR
7440-62-2	Vanadium				NR
7440-66-6	Zinc				NR
	Cyanide				NR

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments:

Keystone DC# 12334-8-5

U.S. EPA - CLP

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MHP537

Lab Name: KEYSTONE ENVIRONMENTAL Contract: 68-W8-0005

Lab Code: KEYTX Case No.: 12334 SAS No.: SDG No.: MHP520

Matrix (soil/water): WATER Lab Sample ID: 890774019

Level (low/med): LOW Date Received: 07/21/89

% Solids: 0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony				NR
7440-38-2	Arsenic				NR
7440-39-3	Barium				NR
7440-41-7	Beryllium				NR
7440-43-9	Cadmium				NR
7440-70-2	Calcium				NR
7440-47-3	Chromium				NR
7440-48-4	Cobalt				NR
7440-50-8	Copper				NR
7439-89-6	Iron				NR
7439-92-1	Lead				NR
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	0.20	U		CV
7439-02-0	Nickel				NR
7440-09-7	Potassium				NR
7782-49-2	Selenium				NR
7440-22-4	Silver				NR
7440-23-5	Sodium				NR
7440-28-0	Thallium				NR
7440-62-2	Vanadium				NR
7440-66-6	Zinc				NR
	Cyanide				NR

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments:

000022

Keystone DC# 12334-8-5

U.S. EPA - CLP

1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MHP538

Lab Name: KEYSTONE ENVIRONMENTAL Contract: 68-W8-0005

Lab Code: KEYTX Case No.: 12334 SAS No.: SDG No.: MHP520

Matrix (soil/water): WATER Lab Sample ID: 890774020

Level (low/med): LOW Date Received: 07/21/89

% Solids: 0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony				NR
7440-38-2	Arsenic				NR
7440-39-3	Barium				NR
7440-41-7	Beryllium				NR
7440-43-9	Cadmium				NR
7440-70-2	Calcium				NR
7440-47-3	Chromium				NR
7440-48-4	Cobalt				NR
7440-50-8	Copper				NR
7439-89-6	Iron				NR
7439-92-1	Lead				NR
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	0.20	U		CV
7439-02-0	Nickel				NR
7440-09-7	Potassium				NR
7782-49-2	Selenium				NR
7440-22-4	Silver				NR
7440-23-5	Sodium				NR
7440-28-0	Thallium				NR
7440-62-2	Vanadium				NR
7440-66-6	Zinc				NR
	Cyanide				NR

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments:

000023

Keystone DC# 12334-8-5

U.S. EPA - CLP

1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MHP539

Lab Name: KEYSTONE ENVIRONMENTAL Contract: 68-W8-0005

Lab Code: KEYTX Case No.: 12334 SAS No.: SDG No.: MHP520

Matrix (soil/water): WATER Lab Sample ID: 890774021

Level (low/med): LOW Date Received: 07/21/89

% Solids: 0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony				NR
7440-38-2	Arsenic				NR
7440-39-3	Barium				NR
7440-41-7	Beryllium				NR
7440-43-9	Cadmium				NR
7440-70-2	Calcium				NR
7440-47-3	Chromium				NR
7440-48-4	Cobalt				NR
7440-50-8	Copper				NR
7439-89-6	Iron				NR
7439-92-1	Lead				NR
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	0.20	U		CV
7439-02-0	Nickel				NR
7440-09-7	Potassium				NR
7782-49-2	Selenium				NR
7440-22-4	Silver				NR
7440-23-5	Sodium				NR
7440-28-0	Thallium				NR
7440-62-2	Vanadium				NR
7440-66-6	Zinc				NR
	Cyanide				NR

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments:

000024

Keystone DC# 12334-8-5

U.S. EPA - CLP

1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MHP540

Lab Name: KEYSTONE ENVIRONMENTAL Contract: 68-W8-0005

Lab Code: KEYTX Case No.: 12334 SAS No.: SDG No.: MHP520

Matrix (soil/water): WATER Lab Sample ID: 890774022

Level (low/med): LOW Date Received: 07/21/89

% Solids: 0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony				NR
7440-38-2	Arsenic				NR
7440-39-3	Barium				NR
7440-41-7	Beryllium				NR
7440-43-9	Cadmium				NR
7440-70-2	Calcium				NR
7440-47-3	Chromium				NR
7440-48-4	Cobalt				NR
7440-50-8	Copper				NR
7439-89-6	Iron				NR
7439-92-1	Lead				NR
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	0.20	U		CV
7439-02-0	Nickel				NR
7440-09-7	Potassium				NR
7782-49-2	Selenium				NR
7440-22-4	Silver				NR
7440-23-5	Sodium				NR
7440-28-0	Thallium				NR
7440-62-2	Vanadium				NR
7440-66-6	Zinc				NR
	Cyanide				NR

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments:

000025

REGION VIII SUMMARY OF DATA QUALITY ASSURANCE REVIEW

guideline references are from Contract #787

Case No.: SAS 4725H TDD No.: F08-8909-08

Site: Richardson Flats

Contractor Laboratory: Silver Valley Labs

Data Reviewer : Annette Sackman Date of Review: 9-15-89

Sample Matrix: 14 Low Soils

Analysis: Metals plus Mercury

Sample Nos.: 4725H01, 4725H02, 4725H03, 4725H04, 4725H05, 4725H06, 4725H07, 4725H08, 4725H09, 4725H10, 4725H11, 4725H12, 4725H13, 4725H14

( ) Data are acceptable for use.

(X) Data are acceptable for use with qualifications noted.

( ) Data are preliminary - pending verification.

( ) Data are unacceptable.

Action required by DPO?

No X Yes The following items require action:

Action required by project officer?

No X Yes

The following are our findings:

All calibration and blank contract compliances were met except that for the last half of the thallium analysis the ICV, ICB, CCV and CCB was not recorded on forms IIA and III.

The CRDL standards were run only at the beginning of the furnace AA analysis and not at the end. No qualifications have been prescribed for this discrepancy so no flags are assigned.

Spike recoveries were low for antimony (52.9%) and thallium (48.7%) and indicate positive values for these elements are biased low and flagged "J", estimated. Undetected values indicate antimony and thallium may or may not be present due to elevated detection limits; therefore, these values are flagged "UJ", estimated. Selenium spike recoveries were very low (-33.1%) and indicate these values are severely biased low. Positive values confirm the presence of the element but are flagged "J" and estimated low. Undetected values do not indicate the nonexistence of the element and are unusable and flagged "R", rejected.

For the MSA analysis for thallium, no raw data was presented for duplicate injections. One of the correlation coefficients was below 0.995 for samples 4725H02, 4725H06, 4725H09 and 4725H11; therefore, thallium values for these samples are flagged "J", estimated. For sample 4725H03, both correlation coefficients were below 0.995; therefore, the thallium value for this sample is unusable and flagged "R", rejected.

For the MSA analysis for selenium, both correlation coefficients were below 0.995 for samples 4725H01, 4725H04, 4725H05 and 4725H08; therefore, values for these samples are unusable and flagged "R", rejected.

The percent difference was high for the serial dilution for cadmium (14.5%); therefore these values are flagged "J", estimated.

Lead was analyzed by ICAP due to high sample concentrations, therefore the CRDL of 5µg/l was not met but is waived under these unusual conditions.

Inorganic Data Completeness Checklist

X Inorganic analysis data (Form I)

X Initial calibration and continuing calibration verification (Form IIA)

X CRDL standard for AA and ICP (Form IIB)

X Blanks (Form III)

X ICP interference Check sample (Form IV)

X Spike sample recovery (Form VA)

X Post digestion spike sample recovery (Form VB)

X Duplicates (Form VI)

X Laboratory control sample (Form VII)

X Standard addition results (Form VIII)

X ICP serial dilutions (Form IX)

X Holding times (Form X)

X Instrument detection limits-quarterly (Form XI)

X ICP interelement correction factors-quarterly (Form II)

X ICP linear ranges-quarterly (Form XIII)

X Raw data for interference checks

X Raw data for calibration standards

X Raw data for blanks

X Raw data for CRI and/or CRA

X Raw data for samples

X Raw data for duplicates

X Raw data for spikes

X Traffic reports

Contract Compliance

I. Initial and Continuing Calibration Verification (ICV and CCV) (guidelines pg. E-4, Form IIA)

1. Was instrument calibrated daily and each time it was set up?
   yes X no

2. Were instruments calibrated using 1 blank and several standards?
   yes X no

3. Were calibration verifications within 90-110%?
   yes X no

4. Were continuing calibrations run at 10% frequency?
   yes X no

5. Were the raw data correctly transcribed onto Form IIA?
   yes no X

Comments: For thallium, one-half of the CCV's were not recorded on Forms IIA. All other requirements were met.

II. CRDL Standards for ICP (CRI) and/or AA (CRA) (guidelines pg. E-6, Form IIB)

1. For ICP analysis, were standards (CRI) @ 2x the CRDL or the IDL (whichever was greater) analyzed at the beginning and the end of each sample run, or at a minimum of twice/8 hour shift, whichever was more frequent?
   yes X no

2. For furnace AA analysis, were standards (CRA) analyzed at the beginning and the end of each sample run, or at a minimum of twice/8 hour shift, whichever was more frequent?
   yes no X

3. Were the CRI and/or CRA standards analyzed <u>after</u> the ICV?
   yes X no

4. Were these data reported on Form IIB?
   yes X no

5. Were the raw data correctly transcribed onto Form IIB?
   yes X no

Comments: No CRA was run at the end of the furnace AA analyses.

III. Blanks (guidelines pg. E-6, Form III)

1. Was the initial calibration blank (ICB) analyzed immediately after the initial calibration verification (ICV)?
   yes X no

2. Was a continuing calibration blank (CCB) analyzed immediately after each continuing calibration verification (CCV)?
   yes X no

3. Was a preparation blank (PB) analyzed at a frequency of at least 1 in 20 samples?
   yes X no NA

4. How many elements were detected above the CRDLs? 0 (if 0, go to question 5)

   4a. How many elements were detected in the blanks at greater than one-half the amount detected in any sample?

5. Were raw data correctly transcribed onto Form III?
   yes no X

Comments: Only one-half of the blanks for thallium were recorded on Form III. All other requirements were met.

IV. ICP Interference Checks (ICS) (guidelines pg. E-7, Form IV)

1. Was the ICS analyzed twice per 8 hour shift?
   yes X no

2. Were the ICSs analyzed before and after samples?
   yes X no

3. Was any massive interference detected?
   yes no X

4. Were the ICSs within ±20% mean value?
   yes X no

5. Were raw data correctly transcribed onto Form IV?
   yes X no

Comments: All requirements met.

V. Spike Sample Analysis (S) (guideline pg. E-8, Form V)

1. Were spikes analyzed at a frequency of 1 in 20 samples?
   yes X no

2. Were spike recoveries correctly calculated?
   yes X no

$$\% \text{ recovery} = \frac{(SSR - SR)}{SA} \times 100$$

SSR = Spiked Sample Result
SR = Sample Result
SA = Spike Added

3. Were spike recoveries within the range of 75-125%?
   yes no X

   3a. For recoveries outside this range, were associated data flagged "N" by the laboratory on Forms I and V?
   yes X no NA

   (an exception if granted where the sample concentration is >4X the spike concentration)

   4. Were raw data correctly transcribed onto Form V?
   yes X no

* Refer to page E-9 (SOW 787) for information regarding the amount of spike to be added for each analyte and for other information about the Spike Sample Analysis.

Comments: For antimony and thallium, recoveries were 52.9% and 48.7%, respectively; therefore, positive values are flagged "J", estimated and undetected values are flagged "UJ". For selenium, recoveries were -33.1%, therefore, positive values are flagged "J", estimated and confirm the presence of selenium in the sample and undetected values are unusable and flagged "R", rejected.

VI. Duplicates (D) (guidelines pg. E-11, Form VI)

1. Were duplicates analyzed at a frequency of 1 in 20 samples?
   yes X no

2. Were RPDs correctly calculated?
   yes X no

$$RPD = \frac{S - D}{(S + D)/2} \times 100$$

S = Sample
D = Duplicate

3a. For sample concentrations >5x the CRDL, were RPDs ±20%? (limits of ±35% apply for soil/sediment/tailings samples)

yes X no NA

3b. For sample concentrations >5x the CRDL, did duplicate analysis results fall outside the control window of ± the CRDL?

yes no X NA

3c. Where the RPDs exceeded the control limits, were the data flagged '*' on Forms I and VI by the laboratory?

yes no NA X

4. Were raw data correctly transcribed onto Form VI?

yes X no

* Other Considerations:
- Field blanks cannot be used for duplicate analyses
- Duplicates must be analyzed for each analytical method

Comments: All requirements met.

VII. **Laboratory Control Sample (LCS) Analysis** (guideline pg. E-12, Form VII)

1. Was an LCS analyzed for every sample delivery group or batch of samples, whichever was more frequent?

yes X no

2. Were recoveries within the 80-120% limit?

yes X no

-if the recoveries were outside this range the analysis must be terminated, the problem corrected and the previous samples associated with that LCS redigested and reanalyzed.

3. Were the raw data correctly transcribed onto Form VII?

yes X no

Comments: All requirements met.

VIII. Furnace Atomic Absorption (AA) QC Analysis (guidelines pg. E-14, Form VIII)

1. Does the raw data package contain absorbance values for two injections per sample, the average values and the relative standard deviation (RSD)?

   yes no X

2. For analyte concentrations > the CRDL, did the RSD for the duplicate injections agree within 20%? (if yes, go to question 3)

   yes no X

   $$RSD = \frac{SD}{M} \times 100$$

   SD = Standard Deviation of Duplicate Injections
   M = Mean of Duplicate Injections

   2a. Were samples that exceeded the 20% criteria reanalyzed?

   yes X no

   2b. Did any reanalyzed samples exceed the 20% criteria?

   yes X no

   2c. If yes, did the laboratory flag the data of Form I with an 'M'?

   yes X no

3. Was the recovery of the spike > 40%? (if yes, go to question 4).

   yes no X

   If no, was the sample diluted and rerun with another spike?

   yes X no

4. Was sample absorbance >50% of spike absorbance?* (if yes, go to question 5).

   yes no X

* Spike absorbance = absorbance of spiked sample - absorbance of sample.

4a. For spike recoveries between 85 and 115%, were results reported to the IDL?

yes X no

$$RPD = \frac{(SSR - SR)}{SA} \times 100$$

SSR = Spike Sample Recovery
SR = Sample Result
SA = Spike Added

4b. For spike recoveries outside the 85 and 115% range, were results reported to the IDL and flagged with 'W'?

yes X no

5. Was spike recovery between 85 and 115%? (if no, go to question 6)

5a. Were results quantified from calibration curve and reported to IDL?

yes no X

6. Was an MSA at 50, 100 and 150% of the sample absorbance analyzed?

yes X no

6a. Was each MSA analysis identified in the raw data along with the slope, intercept and correlation coefficient?

yes X no

6b. Were these data correctly transcribed onto Form VIII?

yes X no

6c. Were correlation coefficients(r) > 0.995?

yes no X

6d. If no, were MSAs run once more?

yes X no

- If the correlation coefficients were still > 0.995, data on Form I must be from the run with the best 'r' and the data on Forms I and VII must be flagged with a '+'.

Were these criteria met?

yes X no

6e. Were all MSA obtained data marked with an 'S' or an S+ on form I?

yes X no

Comments: There was no raw data for duplicate injections for the thallium analysis. For the duplicate sample in the selenium analysis, the duplicate injections and the third injection was greater than 20%D. No flag was assigned since this was a QA sample. The thallium values for the following samples had on correlation coefficient <0.995 and are flagged "J", estimated: 4725H02, 4725H06, 4725H09 and 4725H11. The thallium and selenium values for the following samples had both correlation coefficients <0.995 and are flagged "R", rejected: thallium - 4725H03, selenium - 4725H01, 4725H04, 4725H05 and 4725H08.

IX. ICP Serial Dilution (L) Analysis (guidelines pg. E-12, Form IX)

1. Was an ICP serial dilution performed on each group of samples of a similar matrix (i.e., soil, water) and concentration (i.e., low, high) or for each sample delivery group, whichever was more frequent?

yes X no

2. For elements with concentrations >10X the CRDL, did any exceed the serial dilution results by more than 10%? (if no, skip questions 3 and 4)

yes X no

$$\% \text{ difference} = \frac{I - S}{I} \times 100$$

I = Initial Sample Result
S = Serial Dilution Result (instrument reading X5)

3. Which elements had concentrations that exceeded the 10% criteria? Cadmium

4. Did the laboratory flag these data with an 'E' on Form IX?

yes X no

5. Were the raw data correctly transcribed onto Form IX?

yes X no

Comments: Cadmium values are flagged "J", estimated due to high %D (14.5%).

X. Instrument Detection Limits (IDL) (guidelines pg. E-13, Form XI)

1. Were IDLs reported for each analyzed element?
   yes X no

2. Were IDLs reported for each instrument used?
   yes X no

3. Did the IDLs meet the contract requirements? (refer to pg. E-13, SOW 787)
   yes no X

Comments: Lead was analyzed by ICAP due to high sample concentration. No action is taken due to these conditions.

XI. Interelement Corrections for ICP (guidelines pg. E-13, Form XII)

1. Were correction factors reported on Form XII?
   yes X no

Comments: All requirements met.

XII. Linear Range Analysis (LRA) (guidelines pg. E-14, Form XII)

1. Was a linear range verification standard analyzed?
   yes X no

2. Was the results within ±5% of the true value?
   yes no

Holding Times

Limits: Metals - 6 months; Hg - 30 days; Cn - 28 days.

1. Verified date of sample receipt by laboratory 7-24-89
2. Date of preparation/analyses 8-10-89
3. Were holding times met? yes X no

Analyte	Matrix	Date Sampled	Prep Date	Holding Time	Holding Time Limit/Met	
Mercury	Low soil	7-18-89	8-10-89	23 days	30 days	Yes
Metals	Low soil	7-18-89	8-10-89	23 days	6 months	Yes

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.: 4725H01

Lab Name: SILVER VALLEY LABS., INC. Contract: 68-W8-0074

Lab Code: SILVER Case No.: _____ SAS No.: 4725H SDG No.: 4725HC

Matrix (soil/water): SOIL Lab Sample ID: _____

Level (low/med): LOW Date Received: 07/24/89

% Solids: 69.6

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	18400.			P	
7440-36-0	Antimony	19.8		N	P	JAS
7440-38-2	Arsenic	83.2			P	
7440-39-3	Barium	270.		E	P	
7440-41-7	Beryllium	1.7			P	JAS
7440-43-9	Cadmium	14.6			P	
7440-70-2	Calcium	15000.			P	
7440-47-3	Chromium	21.9			P	
7440-48-4	Cobalt	11.4	B		P	
7440-50-8	Copper	239.			P	
7439-89-6	Iron	30800.			P	
7439-92-1	Lead	1790.			P	
7439-95-4	Magnesium	6130.			P	
7439-96-5	Manganese	1260.			P	
7439-97-6	Mercury	1.0			CV	
7440-02-0	Nickel	23.5			P	
7440-09-7	Potassium	3160.			P	
7782-49-2	Selenium	3.1		+N	F	JAS RAS
7440-22-4	Silver	9.7			P	
7440-23-5	Sodium	239.	B		P	
7440-28-0	Thallium	.81	B	N	F	JAS
7440-62-2	Vanadium	48.7			P	
7440-66-6	Zinc	2770			P	
	Cyanide				NR	

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: YELLOW Clarity After: _____ Artifacts: _____

Comments:

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.: 4725H02

Lab Name: SILVER VALLEY LABS., INC. Contract: 68-W8-0074

Lab Code: SILVER Case No.: ____ SAS No.: 4725H SDG No.: 4725H

Matrix (soil/water): SOIL Lab Sample ID: ____

Level (low/med): LOW Date Received: 07/24/89

% Solids: 73.0

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	8620.			P	
7440-36-0	Antimony	201.		N	P	J AS
7440-38-2	Arsenic	590.			D	
7440-39-3	Barium	147		E	P	
7440-41-7	Beryllium	.86	B		P	
7440-43-9	Cadmium	91.4			P	J AS
7440-70-2	Calcium	25600			P	
7440-47-3	Chromium	.77	U		P	
7440-48-4	Cobalt	43.5			P	
7440-50-8	Copper	753			P	
7439-89-6	Iron	181000			P	
7439-92-1	Lead	14200			P	
7439-95-4	Magnesium	9430			P	
7439-96-5	Manganese	1730			P	
7439-97-6	Mercury	4.9			CV	
7440-02-0	Nickel	21.5			P	
7440-09-7	Potassium	1160.	B		P	
7782-49-2	Selenium	46.2		* N	E	mgb 08/22/89 J AS
7440-22-4	Silver	47.5			P	
7440-23-5	Sodium	181	B		P	
7440-28-0	Thallium	3.6	B	S N	E	J AS
7440-62-2	Vanadium	19.0			P	
7440-66-6	Zinc	15500.			P	
____	Cyanide				NR	
____						

Color Before: BROWN Clarity Before: ____ Texture: MEDIUM

Color After: YELLOW Clarity After: ____ Artifacts: ____

Comments:

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO. 4725H03

Lab Name: SILVER VALLEY LABS., INC. Contract: 68-W8-0074

Lab Code: SILVER Case No.: ____ SAS No.: 4725H SDG No.: 4725

Matrix (soil/water): SOIL Lab Sample ID: ____

Level (low/med): LOW Date Received: 07/24/89

% Solids: 77.9

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	7650			P	
7440-36-0	Antimony	114.		N	P	J 08/22/89
7440-38-2	Arsenic	427			P	
7440-39-3	Barium	130.		E	P	
7440-41-7	Beryllium	.81	B		P	
7440-43-9	Cadmium	82.0			P	J 08/22/89
7440-70-2	Calcium	2610			P	
7440-47-3	Chromium	1.0	B		P	
7440-48-4	Cobalt	38.5			P	
7440-50-8	Copper	459			P	
7439-89-6	Iron	148000			P	
7439-92-1	Lead	9880			P	
7439-95-4	Magnesium	8480			P	
7439-96-5	Manganese	1630.			P	
7439-97-6	Mercury	6.0			CV	
7440-02-0	Nickel	28.8			P	
7440-09-7	Potassium	1150	B		P	mgb J 08/22/89
7782-49-2	Selenium	42.7		*N	F	
7440-22-4	Silver	30.3			P	
7440-23-5	Sodium	173	B		P	
7440-28-0	Thallium	4.1		+N	F	J 08/22/89 R 08/22/89
7440-62-2	Vanadium	21.2			P	
7440-66-6	Zinc	15100			P	
	Cyanide				NR	

Color Before: BROWN Clarity Before: ____ Texture: MEDIUM

Color After: YELLOW Clarity After: ____ Artifacts: ____

Comments:

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

4725H04

Lab Name: SILVER VALLEY LABS., INC. Contract: 68-W8-0074

Lab Code: SILVER Case No.: _____ SAS No.: 4725H SDG No.: 4725H

Matrix (soil/water): SOIL Lab Sample ID: _____

Level (low/med): LOW Date Received: 07/24/89

% Solids: 52.3

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	25100.			P	
7440-36-0	Antimony	200.		N	P	JAS
7440-38-2	Arsenic	776.			P	
7440-39-3	Barium	1220		E	P	
7440-41-7	Beryllium	1.9	B		P	
7440-43-9	Cadmium	100.			P	JAS
7440-70-2	Calcium	82100			P	
7440-47-3	Chromium	33.2			P	
7440-48-4	Cobalt	10.1	B		P	
7440-50-8	Copper	840.			P	
7439-89-6	Iron	58600.			P	
7439-92-1	Lead	13600			P	
7439-95-4	Magnesium	33800			P	
7439-96-5	Manganese	2770.			P	
7439-97-6	Mercury	5.5			CV	
7440-02-0	Nickel	27.0			P	
7440-09-7	Potassium	6270			P	
7782-49-2	Selenium	15.4		+N	P	JAS RAS
7440-22-4	Silver	86.0			P	
7440-23-5	Sodium	447	B		P	
7440-28-0	Thallium	23.2		N	P	JAS
7440-62-2	Vanadium	46.5			P	
7440-66-6	Zinc	15700.			P	
	Cyanide				NR	

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: YELLOW Clarity After: _____ Artifacts: _____

Comments:

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

4725H05

Lab Name: SILVER VALLEY LABS., INC. Contract: 68-W8-0074

Lab Code: SILVER Case No.: _____ SAS No.: 4725H SDG No.: 4725H

Matrix (soil/water): SOIL Lab Sample ID: _____

Level (low/med): LOW Date Received: 07/24/89

% Solids: 78.3

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	2810			P	
7440-36-0	Antimony	178.		N	P	J AS
7440-38-2	Arsenic	320			P	
7440-39-3	Barium	134		E	P	
7440-41-7	Beryllium	.47	B		P	
7440-43-9	Cadmium	149			P	J AS
7440-70-2	Calcium	89700			P	
7440-47-3	Chromium	10.9			P	
7440-48-4	Cobalt	5.3	B		P	
7440-50-8	Copper	61.3			P	
7439-89-6	Iron	44800.			P	
7439-92-1	Lead	9550			P	
7439-95-4	Magnesium	19700.			P	
7439-96-5	Manganese	3090			P	
7439-97-6	Mercury	1.5			CV	
7440-02-0	Nickel	2.9	B		P	
7440-09-7	Potassium	794	B		P	
7782-49-2	Selenium	16.1		+ N	F	J AS R AS
7440-22-4	Silver	60.9			P	
7440-23-5	Sodium	84.6	B		P	
7440-28-0	Thallium	12.7		S N	F	J AS
7440-62-2	Vanadium	8.6	B		P	
7440-66-6	Zinc	26400.			P	
	Cyanide				NR	

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: YELLOW Clarity After: _____ Artifacts: _____

Comments:

FORM I - IN

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.: 4725H06

Lab Name: SILVER VALLEY LABS., INC.   Contract: 68-W8-0074

Lab Code: SILVER   Case No.: ____   SAS No.: 4725H   SDG No.: 4725HC

Matrix (soil/water): SOIL   Lab Sample ID: ____

Level (low/med): LOW   Date Received: 07/24/89

% Solids: 78.6

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	11100.			P	
7440-36-0	Antimony	40.8		N	P	
7440-38-2	Arsenic	241			P	J AS
7440-39-3	Barium	944		E	P	
7440-41-7	Beryllium	.85	B		P	
7440-43-9	Cadmium	62.3			P	J AS
7440-70-2	Calcium	46900.			P	
7440-47-3	Chromium	.71	U		P	
7440-48-4	Cobalt	64.4			P	
7440-50-8	Copper	256			P	
7439-89-6	Iron	44400.			P	
7439-92-1	Lead	3790			P	
7439-95-4	Magnesium	13500.			P	
7439-96-5	Manganese	207000			P	[illegible]
7439-97-6	Mercury	X.24			CV	
7440-02-0	Nickel	69.7			P	
7440-09-7	Potassium	1870			P	
7782-49-2	Selenium	5.6		N	F	J AS
7440-22-4	Silver	13.7			P	
7440-23-5	Sodium	344.	B		P	
7440-28-0	Thallium	8.5		SN	F	J AS
7440-62-2	Vanadium	34.8			P	
7440-66-6	Zinc	18800.			P	
	Cyanide				NR	

Color Before: BROWN   Clarity Before: ____   Texture: MEDIUM

Color After: YELLOW   Clarity After: ____   Artifacts: ____

Comments:

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

4725H07

Lab Name: SILVER VALLEY LABS., INC. Contract: 68-W8-0074

Lab Code: SILVER Case No.: ____ SAS No.: 4725H SDG No.: 4725H

Matrix (soil/water): SOIL Lab Sample ID: ____

Level (low/med): LOW Date Received: 07/24/89

% Solids: 66.8

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	9710			P	
7440-36-0	Antimony	37.6		N	P	JAS
7440-38-2	Arsenic	198			P	
7440-39-3	Barium	384		E	P	
7440-41-7	Beryllium	1.1	B		P	
7440-43-9	Cadmium	102.			P	JAS
7440-70-2	Calcium	90700			P	
7440-47-3	Chromium	9.9			P	
7440-48-4	Cobalt	20.4			P	
7440-50-8	Copper	264.			P	
7439-89-6	Iron	64900.			P	
7439-92-1	Lead	3250			P	
7439-95-4	Magnesium	20700			P	
7439-96-5	Manganese	19100.			P	
7439-97-6	Mercury	.82			CV	
7440-02-0	Nickel	14.0			P	
7440-09-7	Potassium	1880			P	
7782-49-2	Selenium	9.2		N	F	JAS
7440-22-4	Silver	23.9			P	
7440-23-5	Sodium	254	B		P	
7440-28-0	Thallium	10.1		SN	F	JAS
7440-62-2	Vanadium	20.5			P	
7440-66-6	Zinc	17600.			P	
____	Cyanide				NR	

Color Before: BROWN Clarity Before: ____ Texture: MEDIUM

Color After: YELLOW Clarity After: ____ Artifacts: ____

Comments:

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

4725H08

Lab Name: SILVER VALLEY LABS., INC. Contract: 68-W8-0074

Lab Code: SILVER Case No.: _____ SAS No.: 4725H SDG No.: 4725H

Matrix (soil/water): SOIL Lab Sample ID: _____

Level (low/med): LOW Date Received: 07/24/89

% Solids: 64.6

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	14000			P	
7440-36-0	Antimony	80.5		N	P	J AS
7440-38-2	Arsenic	348.			P	
7440-39-3	Barium	286		E	P	
7440-41-7	Beryllium	1.5	B		P	
7440-43-9	Cadmium	82.3			P	J AS
7440-70-2	Calcium	85800			P	
7440-47-3	Chromium	16.5			P	
7440-48-4	Cobalt	33.3			P	
7440-50-8	Copper	567			P	
7439-89-6	Iron	49200			P	
7439-92-1	Lead	3510			P	
7439-95-4	Magnesium	18400			P	
7439-96-5	Manganese	14300			P	
7439-97-6	Mercury	1.1			CV	
7440-02-0	Nickel	25.8			P	
7440-09-7	Potassium	2400			P	
7782-49-2	Selenium	13.2		+N	F	J AS R AS
7440-22-4	Silver	36.9			P	
7440-23-5	Sodium	276	B		P	
7440-28-0	Thallium	14.2		SN	F	J AS Dup. 3.41
7440-62-2	Vanadium	26.9	B		P	
7440-66-6	Zinc	18300			P	
	Cyanide				NR	

Color Before: BROWN Clarity Before: _____ Texture: MEDIU

Color After: YELLOW Clarity After: _____ Artifacts: _____

Comments:

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

4725H09

Lab Name: SILVER VALLEY LABS., INC. Contract: 68-W8-0074

Lab Code: SILVER Case No.: ____ SAS No.: 4725H SDG No.: 4725H

Matrix (soil/water): SOIL Lab Sample ID: ____

Level (low/med): LOW Date Received: 07/24/89

% Solids: 72.6

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	10900			P	
7440-36-0	Antimony	107		N	P	J A8
7440-38-2	Arsenic	295			P	
7440-39-3	Barium	229		E	P	
7440-41-7	Beryllium	1.4	B		P	
7440-43-9	Cadmium	90.2			P	J A8
7440-70-2	Calcium	38700			P	
7440-47-3	Chromium	16.3			P	
7440-48-4	Cobalt	20.1			P	
7440-50-8	Copper	498			P	
7439-89-6	Iron	68700			P	
7439-92-1	Lead	6970			P	
7439-95-4	Magnesium	11100.			P	
7439-96-5	Manganese	3070			P	
7439-97-6	Mercury	5.0			CV	
7440-02-0	Nickel	16.3			P	
7440-09-7	Potassium	1590			P	
7782-49-2	Selenium	21.9		SN	F	J A8
7440-22-4	Silver	36.2			P	
7440-23-5	Sodium	220	B		P	
7440-28-0	Thallium	4.1		SN	F	J A8
7440-62-2	Vanadium	31.2			P	
7440-66-6	Zinc	15900.			P	
	Cyanide				NR	

Color Before: BROWN Clarity Before: ____ Texture: MEDIUM

Color After: YELLOW Clarity After: ____ Artifacts: ____

Comments:

FORM I - IN 7/37

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.: 4725H10

Lab Name: SILVER VALLEY LABS., INC. Contract: 68-W8-0074

Lab Code: SILVER Case No.: ____ SAS No.: 4725H SDG No.: 4725H

Matrix (soil/water): SOIL Lab Sample ID: ____

Level (low/med): LOW Date Received: 07/24/89

% Solids: 79.0

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	20200.			P	
7440-36-0	Antimony	10.1	U	N	P	UJ AS BC 8-23-89
7440-38-2	Arsenic	5.4 10.1	U	S	F	
7440-39-3	Barium	408		E	P	
7440-41-7	Beryllium	1.6			P	
7440-43-9	Cadmium	2.2			P	J AS
7440-70-2	Calcium	9640			P	
7440-47-3	Chromium	18.5			P	
7440-48-4	Cobalt	10.9	B		P	
7440-50-8	Copper	40.7			P	
7439-89-6	Iron	26500.			P	
7439-92-1	Lead	108			P	
7439-95-4	Magnesium	6360			P	
7439-96-5	Manganese	303			P	
7439-97-6	Mercury	.10	B		CV	
7440-02-0	Nickel	17.0			P	
7440-09-7	Potassium	6050			P	
7782-49-2	Selenium	5.6	U	N	F	R AS
7440-22-4	Silver	.41	U		P	
7440-23-5	Sodium	389	B		P	
7440-28-0	Thallium	.23	U	N	F	UJ AS
7440-62-2	Vanadium	37.7			P	
7440-66-6	Zinc	202.			P	
____	Cyanide				NR	

Color Before: BROWN Clarity Before: ____ Texture: MEDIUM

Color After: YELLOW Clarity After: ____ Artifacts: ____

Comments:

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.: 4725H11

Lab Name: SILVER VALLEY LABS., INC. Contract: 68-W8-0074

Lab Code: SILVER Case No.: ____ SAS No.: 4725H SDG No.: 4725H0

Matrix (soil/water): SOIL Lab Sample ID: ____

Level (low/med): LOW Date Received: 07/24/89

% Solids: 37.2

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	19500.			P	
7440-36-0	Antimony	142.		N	P	JAS
7440-38-2	Arsenic	251.			P	
7440-39-3	Barium	1668		E	P	
7440-41-7	Beryllium	2.3	B		P	
7440-43-9	Cadmium	185			P	JAS
7440-70-2	Calcium	249000			P	
7440-47-3	Chromium	18.2			P	
7440-48-4	Cobalt	5.9	B		P	
7440-50-8	Copper	270			P	
7439-89-6	Iron	156000			P	
7439-92-1	Lead	12500			P	
7439-95-4	Magnesium	29700			P	
7439-96-5	Manganese	19600			P	
7439-97-6	Mercury	1.9			CV	
7440-02-0	Nickel	32.1			P	
7440-09-7	Potassium	4790			P	
7782-49-2	Selenium	19.9		N	F	JAS
7440-22-4	Silver	60.6			P	
7440-23-5	Sodium	764	B		P	
7440-28-0	Thallium	24.1		SN	F	JAS
7440-62-2	Vanadium	38.0			P	
7440-66-6	Zinc	24100			P	
	Cyanide				NR	

Color Before: BROWN Clarity Before: ____ Texture: MEDIUM

Color After: YELLOW Clarity After: ____ Artifacts: ____

Comments:

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

4725H12

Lab Name: SILVER VALLEY LABS., INC. Contract: 68-W8-0074

Lab Code: SILVER Case No.: ____ SAS No.: 4725H SDG No.: 4725H0

Matrix (soil/water): SOIL Lab Sample ID: ____

Level (low/med): LOW Date Received: 01/24/89

% Solids: 53.6

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	6880			P	
7440-36-0	Antimony	49.3		N	P	JAS
7440-38-2	Arsenic	839			P	
7440-39-3	Barium	557		E	P	
7440-41-7	Beryllium	1.6	B		P	
7440-43-9	Cadmium	131			P	JAS
7440-70-2	Calcium	167000			P	
7440-47-3	Chromium	1.0	U		P	
7440-48-4	Cobalt	53.3			P	
7440-50-8	Copper	456			P	
7439-89-6	Iron	132000			P	
7439-92-1	Lead	6900			P	
7439-95-4	Magnesium	23400			P	
7439-96-5	Manganese	23700			P	
7439-97-6	Mercury	.73			CV	
7440-02-0	Nickel	26.3			P	
7440-09-7	Potassium	1690.			P	
7782-49-2	Selenium	2.5		S N	F	JAS
7440-22-4	Silver	22.5			P	
7440-23-5	Sodium	206	B		P	
7440-28-0	Thallium	21.0		S N	F	JAS
7440-62-2	Vanadium	18.6	B		P	
7440-66-6	Zinc	20000.			P	
	Cyanide				NR	

Color Before: BROWN Clarity Before: ____ Texture: MEDIUM

Color After: YELLOW Clarity After: ____ Artifacts: ____

Comments:

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.: 4725H13

Lab Name: SILVER VALLEY LABS., INC. Contract: 68-W8-0074

Lab Code: SILVER Case No.: ____ SAS No.: 4725H SDG No.: 4725HC

Matrix (soil/water): SOIL Lab Sample ID: ____

Level (low/med): LOW Date Received: 07/24/89

% Solids: 73.2

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	15200.			P	
7440-36-0	Antimony	53.9		N	P	JAS
7440-38-2	Arsenic	211			P	
7440-39-3	Barium	209		E	P	
7440-41-7	Beryllium	1.4	B		P	
7440-43-9	Cadmium	43.9			P	JAS
7440-70-2	Calcium	14500			P	
7440-47-3	Chromium	11.8			P	
7440-48-4	Cobalt	24.6			P	
7440-50-8	Copper	231			P	
7439-89-6	Iron	86100			P	
7439-92-1	Lead	4430			P	
7439-95-4	Magnesium	6340			P	
7439-96-5	Manganese	1560			P	
7439-97-6	Mercury	3.3			CV	
7440-02-0	Nickel	22.4			P	
7440-09-7	Potassium	2490			P	
7782-49-2	Selenium	25.1		N	F	JAS
7440-22-4	Silver	15.5			P	
7440-23-5	Sodium	215	B		P	
7440-28-0	Thallium	1.2	B	N	F	JAS
7440-62-2	Vanadium	40.5			P	
7440-66-6	Zinc	3580			P	
	Cyanide				NR	

Color Before: BROWN Clarity Before: ____ Texture: MEDIUM

Color After: YELLOW Clarity After: ____ Artifacts: ____

Comments:

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

4725H14

Lab Name: SILVER VALLEY LABS., INC. Contract: 68-W8-0074

Lab Code: SILVER Case No.: ~~47251~~ SAS No.: 4725H SDG No.: 4725H

Matrix (soil/water): SOIL

Lab Sample ID: _____

Level (low/med): LOW

Date Received: 07/24/89

% Solids: ~~77.9~~ 77.4

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	4440			P	
7440-36-0	Antimony	183		N	P	JAS
7440-38-2	Arsenic	555			P	
7440-39-3	Barium	66.0		E	P	
7440-41-7	Beryllium	.63	B		P	
7440-43-9	Cadmium	113			P	JAS
7440-70-2	Calcium	18900			P	
7440-47-3	Chromium	.72	U		P	
7440-48-4	Cobalt	76.8			P	
7440-50-8	Copper	496.			P	
7439-89-6	Iron	263000			P	
7439-92-1	Lead	12200.			P	
7439-95-4	Magnesium	5880.			P	
7439-96-5	Manganese	1370			P	
7439-97-6	Mercury	.81			CV	
7440-02-0	Nickel	31.4			P	
7440-09-7	Potassium	657	B		P	
7782-49-2	Selenium	84.0		N	F	JAS
7440-22-4	Silver	39.8			P	
7440-23-5	Sodium	105	B		P	
7440-28-0	Thallium	6.0		SN	F	JAS
7440-62-2	Vanadium	10.4	B		P	
7440-66-6	Zinc	17500			P	
	Cyanide				NR	

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: YELLOW Clarity After: _____ Artifacts: _____

Comments:

REGION VIII SUMMARY OF DATA QUALITY ASSURANCE REVIEW

guideline references are from Contract #787

Case No.: 12334 TDD No.: F08-8909-08

Site: Richardson Flats

Contractor Laboratory: Keystone-Houston

Data Reviewer : Annette Sackman Date of Review: 10-3-89

Sample Matrix: 5 Low Soils, 15 Low Waters

Analysis: Mercury

Sample Nos.: MHL955, MHL956, MHP500, MHP501, MHP502, MHP503, MHP504, MHP506, MHP507, MHP509, MHP510, MHP511, MHP512, MHP513, MHP514, MHP515, MHP516, MHP517, MHP518, MHP519

(X) Data are acceptable for use.

( ) Data are acceptable for use with qualifications noted.

( ) Data are preliminary - pending verification.

( ) Data are unacceptable.

Action required by DPO?

No X Yes The following items require action:

Action required by project officer?

No X Yes

The following are our findings:

All requirements were met for the mercury analysis. No flags were assigned.

Inorganic Data Completeness Checklist

X	Inorganic analysis data (Form I)
X	Initial calibration and continuing calibration verification (Form IIA)
	CRDL standard for AA and ICP (Form IIB)
X	Blanks (Form III)
	ICP interference Check sample (Form IV)
X	Spike sample recovery (Form VA)
	Post digestion spike sample recovery (Form VB)
X	Duplicates (Form VI)
X	Laboratory control sample (Form VII)
	Standard addition results (Form VIII)
	ICP serial dilutions (Form IX)
X	Holding times (Form X)
X	Instrument detection limits-quarterly (Form XI)
X	ICP interelement correction factors-quarterly (Form II)
X	ICP linear ranges-quarterly (Form XIII)
	Raw data for interference checks
X	Raw data for calibration standards
X	Raw data for blanks
	Raw data for CRI and/or CRA
X	Raw data for samples
X	Raw data for duplicates
X	Raw data for spikes
X	Traffic reports

Contract Compliance

I. Initial and Continuing Calibration Verification (ICV and CCV) (guidelines pg. E-4, Form IIA)

1. Was instrument calibrated daily and each time it was set up?
   yes X no

2. Were instruments calibrated using 1 blank and several standards?
   yes X no

3. Were calibration verifications within 90-110%?
   yes X no

4. Were continuing calibrations run at 10% frequency?
   yes X no

5. Were the raw data correctly transcribed onto Form IIA?
   yes X no

Comments: All requirements met.

II. CRDL Standards for ICP (CRI) and/or AA (CRA) (guidelines pg. E-6, Form IIB)

1. For ICP analysis, were standards (CRI) @ 2x the CRDL or the IDL (whichever was greater) analyzed at the beginning and the end of each sample run, or at a minimum of twice/8 hour shift, whichever was more frequent?
   yes no

2. For furnace AA analysis, were standards (CRA) analyzed at the beginning and the end of each sample run, or at a minimum of twice/8 hour shift, whichever was more frequent?
   yes no

3. Were the CRI and/or CRA standards analyzed after the ICV?
   yes no

4. Were these data reported on Form IIB?
   yes no

5. Were the raw data correctly transcribed onto Form IIB?
   yes no

Comments: Not required.

III. **Blanks** (guidelines pg. E-6, Form III)

1. Was the initial calibration blank (ICB) analyzed immediately after the initial calibration verification (ICV)?
   yes X no

2. Was a continuing calibration blank (CCB) analyzed immediately after each continuing calibration verification (CCV)?
   yes X no

3. Was a preparation blank (PB) analyzed at a frequency of at least 1 in 20 samples?
   yes X no NA

4. How many elements were detected above the CRDLs? 0 (if 0, go to question 5)

   4a. How many elements were detected in the blanks at greater than one-half the amount detected in any sample?

5. Were raw data correctly transcribed onto Form III?
   yes X no

Comments: All requirements met.

IV. **ICP Interference Checks (ICS)** (guidelines pg. E-7, Form IV)

1. Was the ICS analyzed twice per 8 hour shift?
   yes no

2. Were the ICSs analyzed before and after samples?
   yes no

3. Was any massive interference detected?
   yes no

4. Were the ICSs within ±20% mean value?
   yes no

5. Were raw data correctly transcribed onto Form IV?

Comments: Not required.

V. **Spike Sample Analysis (S) (guideline pg. E-8, Form V)**

1. **Were spikes analyzed at a frequency of 1 in 20 samples?**
   yes X no

2. **Were spike recoveries correctly calculated?**
   yes X no

$$\text{\% recovery} = \frac{(SSR - SR)}{SA} \times 100$$

SSR = Spiked Sample Result
SR = Sample Result
SA = Spike Added

3. **Were spike recoveries within the range of 75-125%?**
   yes X no

3a. For recoveries outside this range, were associated data flagged "N" by the laboratory on Forms I and V?
   yes no NA X

(an exception if granted where the sample concentration is >4X the spike concentration)

4. Were raw data correctly transcribed onto Form V?
   yes X no

* Refer to page E-9 (SOW 787) for information regarding the amount of spike to be added for each analyte and for other information about the Spike Sample Analysis.

Comments: All requirements met.

VI. **Duplicates (D) (guidelines pg. E-11, Form VI)**

1. **Were duplicates analyzed at a frequency of 1 in 20 samples?**
   yes X no

2. Were RPDs correctly calculated?
   yes X no

$$RPD = \frac{S - D}{(S + D)/2} \times 100$$

S = Sample
D = Duplicate

3a. For sample concentrations >5x the CRDL, were RPDs ±20%? (limits of ±35% apply for soil/sediment/tailings samples)

yes X no NA

3b. For sample concentrations >5x the CRDL, did duplicate analysis results fall outside the control window of ± the CRDL?

yes no X NA

3c. Where the RPDs exceeded the control limits, were the data flagged '*' on Forms I and VI by the laboratory?

yes no NA

4. Were raw data correctly transcribed onto Form VI?

yes X no

* Other Considerations:
- Field blanks cannot be used for duplicate analyses
- Duplicates must be analyzed for each analytical method

Comments: All requirements met.

VII. Laboratory Control Sample (LCS) Analysis (guideline pg. E-12, Form VII)

1. Was an LCS analyzed for every sample delivery group or batch of samples, whichever was more frequent?

yes X no

2. Were recoveries within the 80-120% limit?

yes X no

-if the recoveries were outside this range the analysis must be terminated, the problem corrected and the previous samples associated with that LCS redigested and reanalyzed.

3. Were the raw data correctly transcribed onto Form VII?

yes X no

Comments: All requirements met.

VIII. Furnace Atomic Absorption (AA) QC Analysis (guidelines pg. E-14, Form VIII)

1. Does the raw data package contain absorbance values for two injections per sample, the average values and the relative standard deviation (RSD)?

   yes no

2. For analyte concentrations > the CRDL, did the RSD for the duplicate injections agree within 20%? (if yes, go to question 3)

   yes no

   $$RSD = \frac{SD}{M} \times 100$$

   SD = Standard Deviation of Duplicate Injections
   M = Mean of Duplicate Injections

   2a. Were samples that exceeded the 20% criteria reanalyzed?

   yes no

   2b. Did any reanalyzed samples exceed the 20% criteria?

   yes no

   2c. If yes, did the laboratory flag the data of Form I with an 'M'?

   yes no

3. Was the recovery of the spike > 40%? (if yes, go to question 4).

   yes no

   If no, was the sample diluted and rerun with another spike?

   yes no

4. Was sample absorbance 50% of spike absorbance?* (if yes, go to question 5).

   yes no

* Spike absorbance = absorbance of spiked sample - absorbance of sample.

4a. For spike recoveries between 85 and 115%, were results reported to the IDL?

yes no

$$RPD = \frac{(SSR - SR)}{SA} \times 100$$

SSR = Spike Sample Recovery
SR = Sample Result
SA = Spike Added

4b. For spike recoveries outside the 85 and 115% range, were results reported to the IDL and flagged with 'W'?

yes no

5. Was spike recovery between 85 and 115%? (if no, go to question 6)

5a. Were results quantified from calibration curve and reported to IDL?

yes no

6. Was an MSA at 50, 100 and 150% of the sample absorbance analyzed?

yes no

6a. Was each MSA analysis identified in the raw data along with the slope, intercept and correlation coefficient?

yes no

6b. Were these data correctly transcribed onto Form VIII?

yes no

6c. Were correlation coefficients(r) > 0.995?

yes no

6d. If no, were MSAs run once more?

yes no

- If the correlation coefficients were still > 0.995, data on Form I must be from the run with the best 'r' and the data on Forms I and VII must be flagged with a '+'.

Were these criteria met?

yes no

6e. Were all MSA obtained data marked with an 'S' or an S+ on form I?

yes no

Comments: Not required.

IX. ICP Serial Dilution (L) Analysis (guidelines pg. E-12, Form IX)

1. Was an ICP serial dilution performed on each group of samples of a similar matrix (i.e., soil, water) and concentration (i.e., low, high) or for each sample delivery group, whichever was more frequent?

   yes no

2. For elements with concentrations >10X the CRDL, did any exceed the serial dilution results by more than 10%? (if no, skip questions 3 and 4)

   yes no

   $$\% \text{ difference} = \frac{I - S}{I} \times 100$$

   I = Initial Sample Result
   S = Serial Dilution Result (instrument reading X5)

3. Which elements had concentrations that exceeded the 10% criteria?

4. Did the laboratory flag these data with an 'E' on Form IX?

   yes no

5. Were the raw data correctly transcribed onto Form IX?

   yes no

Comments: Not required.

X. Instrument Detection Limits (IDL) (guidelines pg. E-13, Form XI)

1. Were IDLs reported for each analyzed element?
   yes X no

2. Were IDLs reported for each instrument used?
   yes X no

3. Did the IDLs meet the contract requirements? (refer to pg. E-13, SOW 787)
   yes X no

Comments: All requirements met.

XI. Interelement Corrections for ICP (guidelines pg. E-13, Form XII)

1. Were correction factors reported on Form XII?
   yes X no

Comments: All requirements met.

XII. Linear Range Analysis (LRA) (guidelines pg. E-14, Form XII)

1. Was a linear range verification standard analyzed?
   yes X no

2. Was the results within ±5% of the true value?
   yes no

Holding Times

Limits: Metals - 6 months; Hg - 30 days; Cn - 28 days.

1. Verified date of sample receipt by laboratory 7-21-89
2. Date of preparation/analyses 8-3-89
3. Were holding times met? yes X no

Analyte	Matrix	Date Sampled	Prep Date	Holding Time	Holding Time Limit	Met
Mercury	Low soil	7-18-89	8-3-89	13 days	30 days	yes
Mercury	Low Water	7-18-89	8-3-89	13 days	30 days	yes

Keystone DC# 12334-8-5

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MHL955

Lab Name: KEYSTONE ENVIRONMENTAL Contract: 68-W8-0005

Lab Code: KEYTX Case No.: 12334 SAS No.: SDG No.: MHL955

Matrix (soil/water): SOIL Lab Sample ID: 890773003

Level (low/med): LOW Date Received: 07/21/89

% Solids: 98.3

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony				NR
7440-38-2	Arsenic				NR
7440-39-3	Barium				NR
7440-41-7	Beryllium				NR
7440-43-9	Cadmium				NR
7440-70-2	Calcium				NR
7440-47-3	Chromium				NR
7440-48-4	Cobalt				NR
7440-50-8	Copper				NR
7439-89-6	Iron				NR
7439-92-1	Lead				NR
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	0.99			CV
7439-02-0	Nickel				NR
7440-09-7	Potassium				NR
7782-49-2	Selenium				NR
7440-22-4	Silver				NR
7440-23-5	Sodium				NR
7440-28-0	Thallium				NR
7440-62-2	Vanadium				NR
7440-66-6	Zinc				NR
	Cyanide				NR

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments:

000007

Keystone DC# 12334-8-5

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MHL956

Lab Name: KEYSTONE ENVIRONMENTAL Contract: 68-W8-0005

Lab Code: KEYTX Case No.: 12334 SAS No.: SDG No.: MHL955

Matrix (soil/water): SOIL Lab Sample ID: 890773006

Level (low/med): LOW Date Received: 07/21/89

% Solids: 97.9

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony				NR
7440-38-2	Arsenic				NR
7440-39-3	Barium				NR
7440-41-7	Beryllium				NR
7440-43-9	Cadmium				NR
7440-70-2	Calcium				NR
7440-47-3	Chromium				NR
7440-48-4	Cobalt				NR
7440-50-8	Copper				NR
7439-89-6	Iron				NR
7439-92-1	Lead				NR
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	1.30			CV
7439-02-0	Nickel				NR
7440-09-7	Potassium				NR
7782-49-2	Selenium				NR
7440-22-4	Silver				NR
7440-23-5	Sodium				NR
7440-28-0	Thallium				NR
7440-62-2	Vanadium				NR
7440-66-6	Zinc				NR
	Cyanide				NR

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments:

Keystone DC# 12334-8-5

U.S. EPA - CLP

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MHP500

Lab Name: KEYSTONE ENVIRONMENTAL Contract: 68-W8-0005

Lab Code: KEYTX Case No.: 12334 SAS No.: SDG No.: MHL955

Matrix (soil/water): SOIL Lab Sample ID: 890773007

Level (low/med): LOW Date Received: 07/21/89

% Solids: 98.6

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony				NR
7440-38-2	Arsenic				NR
7440-39-3	Barium				NR
7440-41-7	Beryllium				NR
7440-43-9	Cadmium				NR
7440-70-2	Calcium				NR
7440-47-3	Chromium				NR
7440-48-4	Cobalt				NR
7440-50-8	Copper				NR
7439-89-6	Iron				NR
7439-92-1	Lead				NR
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	0.88			CV
7439-02-0	Nickel				NR
7440-09-7	Potassium				NR
7782-49-2	Selenium				NR
7440-22-4	Silver				NR
7440-23-5	Sodium				NR
7440-28-0	Thallium				NR
7440-62-2	Vanadium				NR
7440-66-6	Zinc				NR
	Cyanide				NR

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments:

Keystone DC# 12334-8-5

U.S. EPA - CLP

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MHP501

Lab Name: KEYSTONE ENVIRONMENTAL Contract: 68-W8-0005

Lab Code: KEYTX Case No.: 12334 SAS No.: SDG No.: MHL955

Matrix (soil/water): SOIL Lab Sample ID: 890773008

Level (low/med): LOW Date Received: 07/21/89

% Solids: 82.4

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony				NR
7440-38-2	Arsenic				NR
7440-39-3	Barium				NR
7440-41-7	Beryllium				NR
7440-43-9	Cadmium				NR
7440-70-2	Calcium				NR
7440-47-3	Chromium				NR
7440-48-4	Cobalt				NR
7440-50-8	Copper				NR
7439-89-6	Iron				NR
7439-92-1	Lead				NR
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	8.20			CV
7439-02-0	Nickel				NR
7440-09-7	Potassium				NR
7782-49-2	Selenium				NR
7440-22-4	Silver				NR
7440-23-5	Sodium				NR
7440-28-0	Thallium				NR
7440-62-2	Vanadium				NR
7440-66-6	Zinc				NR
	Cyanide				NR

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments:

Keystone DC# 12334-8-5

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.
MHP502

Lab Name: KEYSTONE ENVIRONMENTAL Contract: 68-W8-0005

Lab Code: KEYTX Case No.: 12334 SAS No.: SDG No.: MHL955

Matrix (soil/water): SOIL Lab Sample ID: 890773009

Level (low/med): LOW Date Received: 07/21/89

% Solids: 92.0

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony				NR
7440-38-2	Arsenic				NR
7440-39-3	Barium				NR
7440-41-7	Beryllium				NR
7440-43-9	Cadmium				NR
7440-70-2	Calcium				NR
7440-47-3	Chromium				NR
7440-48-4	Cobalt				NR
7440-50-8	Copper				NR
7439-89-6	Iron				NR
7439-92-1	Lead				NR
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	7.60			CV
7439-02-0	Nickel				NR
7440-09-7	Potassium				NR
7782-49-2	Selenium				NR
7440-22-4	Silver				NR
7440-23-5	Sodium				NR
7440-28-0	Thallium				NR
7440-62-2	Vanadium				NR
7440-66-6	Zinc				NR
	Cyanide				NR

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments:

Keystone DC# 12334-8-5

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MHP503

Lab-Name: KEYSTONE ENVIRONMENTAL Contract: 68-W8-0005

Lab Code: KEYTX Case No.: 12334 SAS No.: SDG No.: MHL955

Matrix (soil/water): WATER Lab Sample ID: 890773010

Level (low/med): LOW Date Received: 07/21/89

% Solids: 0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony				NR
7440-38-2	Arsenic				NR
7440-39-3	Barium				NR
7440-41-7	Beryllium				NR
7440-43-9	Cadmium				NR
7440-70-2	Calcium				NR
7440-47-3	Chromium				NR
7440-48-4	Cobalt				NR
7440-50-8	Copper				NR
7439-89-6	Iron				NR
7439-92-1	Lead				NR
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	0.20	U		CV
7439-02-0	Nickel				NR
7440-09-7	Potassium				NR
7782-49-2	Selenium				NR
7440-22-4	Silver				NR
7440-23-5	Sodium				NR
7440-28-0	Thallium				NR
7440-62-2	Vanadium				NR
7440-66-6	Zinc				NR
	Cyanide				NR

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments:

Keystone DC# 12334-8-5

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MHP504

Lab Name: KEYSTONE ENVIRONMENTAL Contract: 68-W8-0005

Lab Code: KEYTX Case No.: 12334 SAS No.: SDG No.: MHL955

Matrix (soil/water): WATER Lab Sample ID: 890773011

Level (low/med): LOW Date Received: 07/21/89

% Solids: 0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony				NR
7440-38-2	Arsenic				NR
7440-39-3	Barium				NR
7440-41-7	Beryllium				NR
7440-43-9	Cadmium				NR
7440-70-2	Calcium				NR
7440-47-3	Chromium				NR
7440-48-4	Cobalt				NR
7440-50-8	Copper				NR
7439-89-6	Iron				NR
7439-92-1	Lead				NR
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	0.20	U		CV
7439-02-0	Nickel				NR
7440-09-7	Potassium				NR
7782-49-2	Selenium				NR
7440-22-4	Silver				NR
7440-23-5	Sodium				NR
7440-28-0	Thallium				NR
7440-62-2	Vanadium				NR
7440-66-6	Zinc				NR
	Cyanide				NR

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments:

000013

Keystone DC# 12334-8-5

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.
MHP506

Lab Name: KEYSTONE ENVIRONMENTAL Contract: 68-W8-0005

Lab Code: KEYTX Case No.: 12334 SAS No.: SDG No.: MHL955

Matrix (soil/water): WATER Lab Sample ID: 890773012

Level (low/med): LOW Date Received: 07/21/89

% Solids: 0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony				NR
7440-38-2	Arsenic				NR
7440-39-3	Barium				NR
7440-41-7	Beryllium				NR
7440-43-9	Cadmium				NR
7440-70-2	Calcium				NR
7440-47-3	Chromium				NR
7440-48-4	Cobalt				NR
7440-50-8	Copper				NR
7439-89-6	Iron				NR
7439-92-1	Lead				NR
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	0.20	U		CV
7439-02-0	Nickel				NR
7440-09-7	Potassium				NR
7782-49-2	Selenium				NR
7440-22-4	Silver				NR
7440-23-5	Sodium				NR
7440-28-0	Thallium				NR
7440-62-2	Vanadium				NR
7440-66-6	Zinc				NR
	Cyanide				NR

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments:

Keystone DC# 12334-8-5

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MHP507

Lab Name: KEYSTONE ENVIRONMENTAL Contract: 68-W8-0005

Lab Code: KEYTX Case No.: 12334 SAS No.: SDG No.: MHL955

Matrix (soil/water): WATER Lab Sample ID: 890773013

Level (low/med): LOW Date Received: 07/21/89

% Solids: 0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony				NR
7440-38-2	Arsenic				NR
7440-39-3	Barium				NR
7440-41-7	Beryllium				NR
7440-43-9	Cadmium				NR
7440-70-2	Calcium				NR
7440-47-3	Chromium				NR
7440-48-4	Cobalt				NR
7440-50-8	Copper				NR
7439-89-6	Iron				NR
7439-92-1	Lead				NR
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	0.20	U		CV
7439-02-0	Nickel				NR
7440-09-7	Potassium				NR
7782-49-2	Selenium				NR
7440-22-4	Silver				NR
7440-23-5	Sodium				NR
7440-28-0	Thallium				NR
7440-62-2	Vanadium				NR
7440-66-6	Zinc				NR
	Cyanide				NR

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments:

000015

Keystone DC# 12334-8-5

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MHP509

Lab Name: KEYSTONE ENVIRONMENTAL Contract: 68-W8-0005

Lab Code: KEYTX Case No.: 12334 SAS No.: SDG No.: MHL955

Matrix (soil/water): WATER Lab Sample ID: 890773014

Level (low/med): LOW Date Received: 07/21/89

% Solids: 0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony				NR
7440-38-2	Arsenic				NR
7440-39-3	Barium				NR
7440-41-7	Beryllium				NR
7440-43-9	Cadmium				NR
7440-70-2	Calcium				NR
7440-47-3	Chromium				NR
7440-48-4	Cobalt				NR
7440-50-8	Copper				NR
7439-89-6	Iron				NR
7439-92-1	Lead				NR
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	0.20	U		CV
7439-02-0	Nickel				NR
7440-09-7	Potassium				NR
7782-49-2	Selenium				NR
7440-22-4	Silver				NR
7440-23-5	Sodium				NR
7440-28-0	Thallium				NR
7440-62-2	Vanadium				NR
7440-66-6	Zinc				NR
	Cyanide				NR

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments:

000016

Keystone DC# 12334-8-5

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MHP510

Lab Name: KEYSTONE ENVIRONMENTAL Contract: 68-W8-0005

Lab Code: KEYTX Case No.: 12334 SAS No.: SDG No.: MHL955

Matrix (soil/water): WATER Lab Sample ID: 890773015

Level (low/med): LOW Date Received: 07/21/89

% Solids: 0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony				NR
7440-38-2	Arsenic				NR
7440-39-3	Barium				NR
7440-41-7	Beryllium				NR
7440-43-9	Cadmium				NR
7440-70-2	Calcium				NR
7440-47-3	Chromium				NR
7440-48-4	Cobalt				NR
7440-50-8	Copper				NR
7439-89-6	Iron				NR
7439-92-1	Lead				NR
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	0.20	U		CV
7439-02-0	Nickel				NR
7440-09-7	Potassium				NR
7782-49-2	Selenium				NR
7440-22-4	Silver				NR
7440-23-5	Sodium				NR
7440-28-0	Thallium				NR
7440-62-2	Vanadium				NR
7440-66-6	Zinc				NR
	Cyanide				NR

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments:

Keystone OC# 12334-8-5

U.S. EPA - CLP

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MHP511

Lab Name: KEYSTONE ENVIRONMENTAL Contract: 68-W8-0005

Lab Code: KEYTX Case No.: 12334 SAS No.: SDG No.: MHL955

Matrix (soil/water): WATER Lab Sample ID: 890773016

Level (low/med): LOW Date Received: 07/21/89

% Solids: 0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony				NR
7440-38-2	Arsenic				NR
7440-39-3	Barium				NR
7440-41-7	Beryllium				NR
7440-43-9	Cadmium				NR
7440-70-2	Calcium				NR
7440-47-3	Chromium				NR
7440-48-4	Cobalt				NR
7440-50-8	Copper				NR
7439-89-6	Iron				NR
7439-92-1	Lead				NR
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	0.20	U		CV
7439-02-0	Nickel				NR
7440-09-7	Potassium				NR
7782-49-2	Selenium				NR
7440-22-4	Silver				NR
7440-23-5	Sodium				NR
7440-28-0	Thallium				NR
7440-62-2	Vanadium				NR
7440-66-6	Zinc				NR
	Cyanide				NR

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments:

Keystone DC# 12334-8-5

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MHP512

Lab Name: KEYSTONE ENVIRONMENTAL Contract: 68-W8-0005

Lab Code: KEYTX Case No.: 12334 SAS No.: SDG No.: MHL955

Matrix (soil/water): WATER Lab Sample ID: 890773017

Level (low/med): LOW Date Received: 07/21/89

% Solids: 0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony				NR
7440-38-2	Arsenic				NR
7440-39-3	Barium				NR
7440-41-7	Beryllium				NR
7440-43-9	Cadmium				NR
7440-70-2	Calcium				NR
7440-47-3	Chromium				NR
7440-48-4	Cobalt				NR
7440-50-8	Copper				NR
7439-89-6	Iron				NR
7439-92-1	Lead				NR
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	0.20	U		CV
7439-02-0	Nickel				NR
7440-09-7	Potassium				NR
7782-49-2	Selenium				NR
7440-22-4	Silver				NR
7440-23-5	Sodium				NR
7440-28-0	Thallium				NR
7440-62-2	Vanadium				NR
7440-66-6	Zinc				NR
	Cyanide				NR

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments:

Keystone DC# 12334-8-5

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MHP513

Lab Name: KEYSTONE ENVIRONMENTAL Contract: 68-W8-0005

Lab Code: KEYTX Case No.: 12334 SAS No.: SDG No.: MHL955

Matrix (soil/water): WATER Lab Sample ID: 890773020

Level (low/med): LOW Date Received: 07/21/89

% Solids: 0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony				NR
7440-38-2	Arsenic				NR
7440-39-3	Barium				NR
7440-41-7	Beryllium				NR
7440-43-9	Cadmium				NR
7440-70-2	Calcium				NR
7440-47-3	Chromium				NR
7440-48-4	Cobalt				NR
7440-50-8	Copper				NR
7439-89-6	Iron				NR
7439-92-1	Lead				NR
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	0.20	U		CV
7439-02-0	Nickel				NR
7440-09-7	Potassium				NR
7782-49-2	Selenium				NR
7440-22-4	Silver				NR
7440-23-5	Sodium				NR
7440-28-0	Thallium				NR
7440-62-2	Vanadium				NR
7440-66-6	Zinc				NR
	Cyanide				NR

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments:

Keystone DC# 12334-8-5

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MHP514

Lab Name: KEYSTONE ENVIRONMENTAL Contract: 68-W8-0005

Lab Code: KEYTX Case No.: 12334 SAS No.: SDG No.: MHL955

Matrix (soil/water): WATER Lab Sample ID: 890773021

Level (low/med): LOW Date Received: 07/21/89

% Solids: 0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony				NR
7440-38-2	Arsenic				NR
7440-39-3	Barium				NR
7440-41-7	Beryllium				NR
7440-43-9	Cadmium				NR
7440-70-2	Calcium				NR
7440-47-3	Chromium				NR
7440-48-4	Cobalt				NR
7440-50-8	Copper				NR
7439-89-6	Iron				NR
7439-92-1	Lead				NR
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	0.20	U		CV
7439-02-0	Nickel				NR
7440-09-7	Potassium				NR
7782-49-2	Selenium				NR
7440-22-4	Silver				NR
7440-23-5	Sodium				NR
7440-28-0	Thallium				NR
7440-62-2	Vanadium				NR
7440-66-6	Zinc				NR
	Cyanide				NR

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments:

Keystone DC# 12334-8-5

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MHP515

Lab Name: KEYSTONE ENVIRONMENTAL Contract: 68-W8-0005

Lab Code: KEYTX Case No.: 12334 SAS No.: SDG No.: MHL955

Matrix (soil/water): WATER Lab Sample ID: 890773022

Level (low/med): LOW Date Received: 07/21/89

% Solids: 0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony				NR
7440-38-2	Arsenic				NR
7440-39-3	Barium				NR
7440-41-7	Beryllium				NR
7440-43-9	Cadmium				NR
7440-70-2	Calcium				NR
7440-47-3	Chromium				NR
7440-48-4	Cobalt				NR
7440-50-8	Copper				NR
7439-89-6	Iron				NR
7439-92-1	Lead				NR
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	0.20	U		CV
7439-02-0	Nickel				NR
7440-09-7	Potassium				NR
7782-49-2	Selenium				NR
7440-22-4	Silver				NR
7440-23-5	Sodium				NR
7440-28-0	Thallium				NR
7440-62-2	Vanadium				NR
7440-66-6	Zinc				NR
	Cyanide				NR

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments:

Keystone DC# 12334-8-5

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MHP516

Lab Name: KEYSTONE ENVIRONMENTAL Contract: 68-W8-0005

Lab Code: KEYTX Case No.: 12334 SAS No.: SDG No.: MHL955

Matrix (soil/water): WATER Lab Sample ID: 890773023

Level (low/med): LOW Date Received: 07/21/89

% Solids: 0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony				NR
7440-38-2	Arsenic				NR
7440-39-3	Barium				NR
7440-41-7	Beryllium				NR
7440-43-9	Cadmium				NR
7440-70-2	Calcium				NR
7440-47-3	Chromium				NR
7440-48-4	Cobalt				NR
7440-50-8	Copper				NR
7439-89-6	Iron				NR
7439-92-1	Lead				NR
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	8.00			CV
7439-02-0	Nickel				NR
7440-09-7	Potassium				NR
7782-49-2	Selenium				NR
7440-22-4	Silver				NR
7440-23-5	Sodium				NR
7440-28-0	Thallium				NR
7440-62-2	Vanadium				NR
7440-66-6	Zinc				NR
	Cyanide				NR

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments:

Keystone DC# 12334-8-5

U.S. EPA - CLP

1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MHP517

Lab Name: KEYSTONE ENVIRONMENTAL Contract: 68-W8-0005

Lab Code: KEYTX Case No.: 12334 SAS No.: SDG No.: MHL955

Matrix (soil/water): WATER Lab Sample ID: 890773024

Level (low/med): LOW Date Received: 07/21/89

% Solids: 0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony				NR
7440-38-2	Arsenic				NR
7440-39-3	Barium				NR
7440-41-7	Beryllium				NR
7440-43-9	Cadmium				NR
7440-70-2	Calcium				NR
7440-47-3	Chromium				NR
7440-48-4	Cobalt				NR
7440-50-8	Copper				NR
7439-89-6	Iron				NR
7439-92-1	Lead				NR
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	0.20	U		CV
7439-02-0	Nickel				NR
7440-09-7	Potassium				NR
7782-49-2	Selenium				NR
7440-22-4	Silver				NR
7440-23-5	Sodium				NR
7440-28-0	Thallium				NR
7440-62-2	Vanadium				NR
7440-66-6	Zinc				NR
	Cyanide				NR

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments:

Keystone DC# 12334-8-5

U.S. EPA - CLP

1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MHP518

Lab Name: KEYSTONE ENVIRONMENTAL Contract: 68-W8-0005

Lab Code: KEYTX Case No.: 12334 SAS No.: SDG No.: MHL955

Matrix (soil/water): WATER Lab Sample ID: 890773025

Level (low/med): LOW Date Received: 07/21/89

% Solids: 0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony				NR
7440-38-2	Arsenic				NR
7440-39-3	Barium				NR
7440-41-7	Beryllium				NR
7440-43-9	Cadmium				NR
7440-70-2	Calcium				NR
7440-47-3	Chromium				NR
7440-48-4	Cobalt				NR
7440-50-8	Copper				NR
7439-89-6	Iron				NR
7439-92-1	Lead				NR
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	0.20	U		CV
7439-02-0	Nickel				NR
7440-09-7	Potassium				NR
7782-49-2	Selenium				NR
7440-22-4	Silver				NR
7440-23-5	Sodium				NR
7440-28-0	Thallium				NR
7440-62-2	Vanadium				NR
7440-66-6	Zinc				NR
	Cyanide				NR

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments:

Keystone DC# 12334-8-5

U.S. EPA - CLP

1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MHP519

Lab Name: KEYSTONE ENVIRONMENTAL Contract: 68-W8-0005

Lab Code: KEYTX Case No.: 12334 SAS No.: SDG No.: MHL955

Matrix (soil/water): WATER Lab Sample ID: 890773026

Level (low/med): LOW Date Received: 07/21/89

% Solids: 0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony				NR
7440-38-2	Arsenic				NR
7440-39-3	Barium				NR
7440-41-7	Beryllium				NR
7440-43-9	Cadmium				NR
7440-70-2	Calcium				NR
7440-47-3	Chromium				NR
7440-48-4	Cobalt				NR
7440-50-8	Copper				NR
7439-89-6	Iron				NR
7439-92-1	Lead				NR
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	0.20	U		CV
7439-02-0	Nickel				NR
7440-09-7	Potassium				NR
7782-49-2	Selenium				NR
7440-22-4	Silver				NR
7440-23-5	Sodium				NR
7440-28-0	Thallium				NR
7440-62-2	Vanadium				NR
7440-66-6	Zinc				NR
	Cyanide				NR

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments:

REGION VIII SUMMARY OF DATA QUALITY ASSURANCE REVIEW

*****guideline references are from Contract #787*****

Case No.: 12334 TDD No.: F08-8909-08

Site: Richardson Flats

Contractor Laboratory: Silver Valley Labs

Data Reviewer : Annette Sackman Date of Review: 10-3-89

Sample Matrix: 5 Low Soils, 15 Low Waters

Analysis: Metals plus Mercury

Sample Nos.: MHL955, MHL956, MHP500, MHP501, MHP502, MHP503, MHP504, MHP506, MHP507, MHP509, MHP510, MHP511, MHP512, MHP513, MHP514, MHP515, MHP516, MHP517, MHP518, MHP519

( ) Data are acceptable for use.

(X) Data are acceptable for use with qualifications noted.

( ) Data are preliminary - pending verification.

( ) Data are unacceptable.

Action required by DPO?

No X Yes The following items require action:

Action required by project officer?

No X Yes

The following are our findings:

These samples were originally sent to Keystone-Houston Labs for metal analysis; however, due to contractual problems, Keystone Houston only analyzed for mercury and then sent the samples to Silver Valley Labs for complete metal analysis. This package is the results for the analysis performed by Silver Valley Labs and includes metals plus mercury analysis. Since the samples were first sent to Keystone-Houston Labs, the holding times for the mercury analysis performed by Sliver Valley Labs was missed by seven days. Therefore, all mercury values in this package are flagged "J" and considered estimate.

The remaining data is acceptable for use with the following qualifications:

No final CRDL standard was run for the furnace AA analysis. The CRDL value for selenium was transposed on Form IIB and the correct %D is 78.6%; however, no qualifications are required for these discrepancies.

The spike recovery was below 40% for selenium values for water matrix (22.8%); therefore, all associated selenium values are unusable and rejected "R". The thallium spike recovery for soil matrix was low (54.3%); therefore all thallium soil values are flagged "J" and considered biased low.

Duplicate results for lead water values obtained by ICAP were high (37.0%RPD). Since sample MHP516 was the only water sample in which lead was analyzed by ICAP, this lead value is considered estimated and flagged "J".

All MSA criteria were followed except for the following: MSA was required for arsenic for sample MHP517 and thallium for sample MHP516; therefore these values are estimated and flagged "J". One correlation coefficient was <0.995 for the arsenic analysis for sample MHP518; therefore, this value is flagged "J", estimated. Both correlation coefficients were <0.995 for the arsenic analysis for sample MHP504; therefore this value is unusable and flagged "R", rejected.

Serial dilution results for arsenic and zinc soil values were slightly high, 12.1% and 13.3 %, respectively. These soil values are therefore flagged "J", estimated.

The arsenic value for sample MHP516 was analyzed by furnace AA and reported as 46.5 µg/l; however, this number was not multiplied by the dilution factor of 50. The correct arsenic value is actually 2326 µg/l for this sample.

Inorganic Data Completeness Checklist

X Inorganic analysis data (Form I)

X Initial calibration and continuing calibration verification (Form IIA)

X CRDL standard for AA and ICP (Form IIB)

X Blanks (Form III)

X ICP interference Check sample (Form IV)

X Spike sample recovery (Form VA)

X Post digestion spike sample recovery (Form VB)

X Duplicates (Form VI)

X Laboratory control sample (Form VII)

X Standard addition results (Form VIII)

X ICP serial dilutions (Form IX)

X Holding times (Form X)

X Instrument detection limits-quarterly (Form XI)

X ICP interelement correction factors-quarterly (Form II)

X ICP linear ranges-quarterly (Form XIII)

X Raw data for interference checks

X Raw data for calibration standards

X Raw data for blanks

X Raw data for CRI and/or CRA

X Raw data for samples

X Raw data for duplicates

X Raw data for spikes

X Traffic reports

Contract Compliance

I. Initial and Continuing Calibration Verification (ICV and CCV) (guidelines pg. E-4, Form IIA)

1. Was instrument calibrated daily and each time it was set up?
   yes X no

2. Were instruments calibrated using 1 blank and several standards?
   yes X no

3. Were calibration verifications within 90-110%?
   yes X no

4. Were continuing calibrations run at 10% frequency?
   yes X no

5. Were the raw data correctly transcribed onto Form IIA?
   yes X no

Comments: All requirements met.

II. CRDL Standards for ICP (CRI) and/or AA (CRA) (guidelines pg. E-6, Form IIB)

1. For ICP analysis, were standards (CRI) @ 2x the CRDL or the IDL (whichever was greater) analyzed at the beginning and the end of each sample run, or at a minimum of twice/8 hour shift, whichever was more frequent?
   yes X no

2. For furnace AA analysis, were standards (CRA) analyzed at the beginning and the end of each sample run, or at a minimum of twice/8 hour shift, whichever was more frequent?
   yes no X

3. Were the CRI and/or CRA standards analyzed <u>after</u> the ICV?
   yes X no

4. Were these data reported on Form IIB?
   yes X no

5. Were the raw data correctly transcribed onto Form IIB?
   yes no X

Comments: The CRA was run only at the beginning of the sample runs and not at the end. The selenium CRDL value was transposed on Form IIB and the correct %D is 78.6%. No flags are required for these discrepancies.

III. **Blanks** (guidelines pg. E-6, Form III)

1. Was the initial calibration blank (ICB) analyzed immediately after the initial calibration verification (ICV)?
   yes X no

2. Was a continuing calibration blank (CCB) analyzed immediately after each continuing calibration verification (CCV)?
   yes X no

3. Was a preparation blank (PB) analyzed at a frequency of at least 1 in 20 samples?
   yes X no NA

4. How many elements were detected above the CRDLs? 0 (if 0, go to question 5)

   4a. How many elements were detected in the blanks at greater than one-half the amount detected in any sample?

5. Were raw data correctly transcribed onto Form III?
   yes X no

Comments: All requirements met.

IV. **ICP Interference Checks (ICS)** (guidelines pg. E-7, Form IV)

1. Was the ICS analyzed twice per 8 hour shift?
   yes X no

2. Were the ICSs analyzed before and after samples?
   yes X no

3. Was any massive interference detected?
   yes no X

4. Were the ICSs within ±20% mean value?
   yes X no

5. Were raw data correctly transcribed onto Form IV?

Comments: All requirements met.

V. Spike Sample Analysis (S) (guideline pg. E-8, Form V)

1. Were spikes analyzed at a frequency of 1 in 20 samples?
   yes X no

2. Were spike recoveries correctly calculated?
   yes X no

$$\% \text{ recovery} = \frac{(SSR - SR)}{SA} \times 100$$

SSR = Spiked Sample Result
SR = Sample Result
SA = Spike Added

3. Were spike recoveries within the range of 75-125%?
   yes no X

3a. For recoveries outside this range, were associated data flagged "N" by the laboratory on Forms I and V?
   yes X no NA

(an exception if granted where the sample concentration is >4X the spike concentration)

4. Were raw data correctly transcribed onto Form V?
   yes X no

* Refer to page E-9 (SOW 787) for information regarding the amount of spike to be added for each analyte and for other information about the Spike Sample Analysis.

Comments: Selenium water values are unusable and flagged "R" due to spike recoveries below 40% (22.8%). Thallium soil values are estimated and flagged "J" due to low spike recoveries (54.3%).

VI. Duplicates (D) (guidelines pg. E-11, Form VI)

1. Were duplicates analyzed at a frequency of 1 in 20 samples?
   yes X no

2. Were RPDs correctly calculated?
   yes X no

$$RPD = \frac{S - D}{(S + D)/2} \times 100$$

S = Sample
D = Duplicate

3a. For sample concentrations >5x the CRDL, were RPDs ±20%? (limits of ±35% apply for soil/sediment/tailings samples)

yes no X NA

3b. For sample concentrations >5x the CRDL, did duplicate analysis results fall outside the control window of ± the CRDL?

yes no X NA

3c. Where the RPDs exceeded the control limits, were the data flagged '*' on Forms I and VI by the laboratory?

yes X no NA

4. Were raw data correctly transcribed onto Form VI?

yes no X

* Other Considerations:
- Field blanks cannot be used for duplicate analyses
- Duplicates must be analyzed for each analytical method

Comments: The selenium values for water sample MHP503D was done on ICAP and was compared to the furnace AA value for MHP503 which gave an RPD of 200%. The ICAP value for MHP503 of 28.02 µg/l, which should have been used for comparison, gives a new RPD of 27.8%. Since no water samples were analyzed by ICAP no flags are assigned to selenium values. Duplicate results for arsenic and lead water samples were high when analyzed by ICAP (200% and 37.0%, respectively). No arsenic values were acquired by ICAP analysis but the lead value for sample MHP516 was analyzed by ICAP and is therefore estimated and flagged "J".

VII. **Laboratory Control Sample (LCS) Analysis** (guideline pg. E-12, Form VII)

1. Was an LCS analyzed for every sample delivery group or batch of samples, whichever was more frequent?

yes X no

2. Were recoveries within the 80-120% limit?

yes X no

-if the recoveries were outside this range the analysis must be terminated, the problem corrected and the previous samples associated with that LCS redigested and reanalyzed.

3. Were the raw data correctly transcribed onto Form VII?

yes X no

Comments: All requirements met.

VIII. Furnace Atomic Absorption (AA) QC Analysis (guidelines pg. E-14, Form VIII)

1. Does the raw data package contain absorbance values for two injections per sample, the average values and the relative standard deviation (RSD)?

   yes X no

2. For analyte concentrations > the CRDL, did the RSD for the duplicate injections agree within 20%? (if yes, go to question 3)

   yes X no

   $$RSD = \frac{SD}{M} \times 100$$

   SD = Standard Deviation of Duplicate Injections
   M = Mean of Duplicate Injections

   2a. Were samples that exceeded the 20% criteria reanalyzed?

   yes no

   2b. Did any reanalyzed samples exceed the 20% criteria?

   yes no

   2c. If yes, did the laboratory flag the data of Form I with an 'M'?

   yes no

3. Was the recovery of the spike > 40%? (if yes, go to question 4).

   yes no X

   If no, was the sample diluted and rerun with another spike?

   yes X no

4. Was sample absorbance >50% of spike absorbance?* (if yes, go to question 5).

   yes no X

* Spike absorbance = absorbance of spiked sample - absorbance of sample.

4a. For spike recoveries between 85 and 115%, were results reported to the IDL?

yes X no

$$RPD = \frac{(SSR - SR)}{SA} \times 100$$

SSR = Spike Sample Recovery
SR = Sample Result
SA = Spike Added

4b. For spike recoveries outside the 85 and 115% range, were results reported to the IDL and flagged with 'W'?

yes X no

5. Was spike recovery between 85 and 115%? (if no, go to question 6)

5a. Were results quantified from calibration curve and reported to IDL?

yes X no

6. Was an MSA at 50, 100 and 150% of the sample absorbance analyzed?

yes no X

6a. Was each MSA analysis identified in the raw data along with the slope, intercept and correlation coefficient?

yes X no

6b. Were these data correctly transcribed onto Form VIII?

yes no

6c. Were correlation coefficients(r) > 0.995?

yes no X

6d. If no, were MSAs run once more?

yes X no

- If the correlation coefficients were still > 0.995, data on Form I must be from the run with the best 'r' and the data on Forms I and VII must be flagged with a '+'.

Were these criteria met?

yes X no

6e. Were all MSA obtained data marked with an 'S' or an S+ on form I?

yes X no

Comments: MSA was required but not performed for sample MHP516's thallium value or for sample MHP517's arsenic value. These values are estimated and flagged "J". One correlation coefficient was <0.995 for sample MHP518's arsenic value and is flagged "J", estimated. Both correlation coefficients were <0.995 for sample MHP504's arsenic value and is considered unusable and flagged "R", rejected.

IX. ICP Serial Dilution (L) Analysis (guidelines pg. E-12, Form IX)

1. Was an ICP serial dilution performed on each group of samples of a similar matrix (i.e., soil, water) and concentration (i.e., low, high) or for each sample delivery group, whichever was more frequent?

yes X no

2. For elements with concentrations >10X the CRDL, did any exceed the serial dilution results by more than 10%? (if no, skip questions 3 and 4)

yes X no

$$\% \text{ difference} = \frac{I - S}{I} \times 100$$

I = Initial Sample Result
S = Serial Dilution Result (instrument reading X5)

3. Which elements had concentrations that exceeded the 10% criteria? For soils, arsenic and zinc.

4. Did the laboratory flag these data with an 'E' on Form IX?

yes X no

5. Were the raw data correctly transcribed onto Form IX?

yes X no

Comments: For the soil samples, the arsenic and zinc values are flagged "J", estimated due to slightly high %D's of 12.1 and 13.3%, respectively.

X. Instrument Detection Limits (IDL) (guidelines pg. E-13, Form XI)

1. Were IDLs reported for each analyzed element?
   yes X no

2. Were IDLs reported for each instrument used?
   yes X no

3. Did the IDLs meet the contract requirements? (refer to pg. E-13, SOW 787)
   yes X no

Comments: All requirements met.

XI. Interelement Corrections for ICP (guidelines pg. E-13, Form XII)

1. Were correction factors reported on Form XII?
   yes X no

Comments: All requirements met.

XII. Linear Range Analysis (LRA) (guidelines pg. E-14, Form XII)

1. Was a linear range verification standard analyzed?
   yes X no

2. Was the results within ±5% of the true value?
   yes no

Holding Times

Limits: Metals - 6 months; Hg - 30 days; Cn - 28 days.

1. Verified date of sample receipt by laboratory 8-16-89
2. Date of preparation/analyses 8-25-89
3. Were holding times met? yes no X

Mercury holding times were not met; therefore, all mercury values are estimated low and flagged "J".

Analyte	Matrix	Date Sampled	Prep Date	Holding Time	Holding Time Limit/Met	
Mercury	Low soil	7-18-89	8-25-89	37 days	30 days	no
Mercury	Low water	7-18-89	8-25-89	37 days	30 days	no
Metals	Low soil	7-18-89	8-25-89	37 days	6 months	yes
Metals	Low water	7-18-89	8-25-89	37 days	6 months	yes

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EPA SAMPLE NO.

1

INORGANIC ANALYSIS DATA SHEET

MHL955

Lab Name: SILVER VALLEY LABS., INC. Contract: ~~68-89-0071~~ 68-W8-0074

Lab Code: SILVER Case No.: 12334 SAS No.: 4134 AC SDG No.: MHL955

Matrix (soil/water): SOIL Lab Sample ID:

Level (low/med): LOW Date Received: 08/16/89

% Solids: 98.5

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	691		*	P	
7440-36-0	Antimony	63.1			P	
7440-38-2	Arsenic	220			P	J AB
7440-39-3	Barium	153		*	P	
7440-41-7	Beryllium	0.22	U		P	
7440-43-9	Cadmium	21.1			P	
7440-70-2	Calcium	37000			P	
7440-47-3	Chromium	2.0	B		P	
7440-48-4	Cobalt	5.5	B		P	
7440-50-8	Copper	149			P	
7439-89-6	Iron	44700			P	
7439-92-1	Lead	2580			P	
7439-95-4	Magnesium	11200			P	
7439-96-5	Manganese	1440			P	
7439-97-6	Mercury	~~0.9~~ 1.0	~~N~~ N	~~J AB~~	CV	AC 9-12-89
7440-02-0	Nickel	8.2			P	
7440-09-7	Potassium	255	B		P	
7782-49-2	Selenium	23.6			F	
7440-22-4	Silver	12.6		*	P	
7440-23-5	Sodium	22.4	B		P	
7440-28-0	Thallium	6.6		NS	F	J AB
7440-62-2	Vanadium	1.3	B		P	
7440-66-6	Zinc	3220		E	P	
	Cyanide				NR	

Color Before: BROWN Clarity Before: Texture: MEDIUM

Color After: YELLOW Clarity After: Artifacts:

Comments:

U.S. EPA - CLP

EPA SAMPLE NO.

1

INORGANIC ANALYSIS DATA SHEET | MHL956

Lab Name: SILVER VALLEY LABS.,INC. Contract: ~~68-D9-0071~~ 68-W8-0074

Lab Code: SILVER Case No.: 12334 SAS No.: DC 9-4289 SDG No.: MHL955

Matrix (soil/water): SOIL Lab Sample ID:

Level (low/med): LOW Date Received: 08/16/89

% Solids: 98.4

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	1040		*	P	
7440-36-0	Antimony	84.4			P	
7440-38-2	Arsenic	208			P	J AS
7440-39-3	Barium	86.9		*	P	
7440-41-7	Beryllium	0.22	U		P	
7440-43-9	Cadmium	41.2			P	
7440-70-2	Calcium	54500			P	
7440-47-3	Chromium	6.0			P	
7440-48-4	Cobalt	2.6	B		P	
7440-50-8	Copper	205			P	
7439-89-6	Iron	36500			P	
7439-92-1	Lead	3060			P	
7439-95-4	Magnesium	18500			P	
7439-96-5	Manganese	1740			P	
7439-97-6	Mercury	~~1.4~~ 1.9		N J AS	CV	DC 9-28-89
7440-02-0	Nickel	9.4			P	
7440-09-7	Potassium	496	B		P	
7782-49-2	Selenium	12.7			F	
7440-22-4	Silver	18.5		*	P	
7440-23-5	Sodium	34.8	B		P	
7440-28-0	Thallium	3.0		NS	F	J AS
7440-62-2	Vanadium	3.8	B		P	
7440-66-6	Zinc	5710		E	P	
	Cyanide				NR	

Color Before: BROWN Clarity Before: Texture: MEDIUM

Color After: YELLOW Clarity After: Artifacts:

Comments:

U.S. EPA - CLP

EPA SAMPLE NO.

1

INORGANIC ANALYSIS DATA SHEET

MHP500

Lab Name: SILVER VALLEY LABS., INC. Contract: ~~68-03-0071~~ 68-W8-0074

Lab Code: SILVER Case No.: 12334 SAS No.: DC 4/12/89 SDG No.: MHL955

Matrix (soil/water): SOIL Lab Sample ID:

Level (low/med): LOW Date Received: 08/16/89

% Solids: 99.2

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	1530		*	P	
7440-36-0	Antimony	87.0			P	
7440-38-2	Arsenic	222			P	J ~~N~~ S
7440-39-3	Barium	32.8	B	*	P	
7440-41-7	Beryllium	0.22	U		P	
7440-43-9	Cadmium	95.9			P	
7440-70-2	Calcium	68200			P	
7440-47-3	Chromium	8.8			P	
7440-48-4	Cobalt	7.4	B		P	
7440-50-8	Copper	336			P	
7439-89-6	Iron	53400			P	
7439-92-1	Lead	4520			P	
7439-95-4	Magnesium	23000			P	
7439-96-5	Manganese	2320			P	
7439-97-6	Mercury	1.1		~~N~~ J ~~S~~	CV	DC 4/12/89
7440-02-0	Nickel	7.1	B		P	
7440-09-7	Potassium	827	B		P	
7782-49-2	Selenium	19.2			F	
7440-22-4	Silver	22.1		*	P	
7440-23-5	Sodium	42.6	B		P	
7440-28-0	Thallium	4.2	B	N	F	J ~~N~~ S
7440-62-2	Vanadium	3.7	B		P	
7440-66-6	Zinc	14100		E	P	
	Cyanide				NR	

Color Before: BROWN Clarity Before: Texture: MEDIUM

Color After: YELLOW Clarity After: Artifacts:

Comments:

U.S. EPA - CLP

EPA SAMPLE NO.

1

INORGANIC ANALYSIS DATA SHEET

MHP501

Lab Name: SILVER VALLEY LABS.,INC. Contract: ~~68-D3-0071~~ 68-W8-0094

Lab Code: SILVER Case No.: 12334 SAS No.: DC 9/13/89 SDG No.: MHL955

Matrix (soil/water): SOIL Lab Sample ID:

Level (low/med): LOW Date Received: 08/16/89

% Solids: 81.7

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	1030		*	P	
7440-36-0	Antimony	120			P	
7440-38-2	Arsenic	259			P	J DC
7440-39-3	Barium	117		*	P	
7440-41-7	Beryllium	0.27	U		P	
7440-43-9	Cadmium	117			P	
7440-70-2	Calcium	5400			P	
7440-47-3	Chromium	0.69	U		P	
7440-48-4	Cobalt	3.9	B		P	
7440-50-8	Copper	281			P	
7439-89-6	Iron	97400			P	
7439-92-1	Lead	9300			P	
7439-95-4	Magnesium	1140	B		P	
7439-96-5	Manganese	212			P	
7439-97-6	Mercury	~~1.3~~ 1.7		N J DC	CV	DC 9/12/89
7440-02-0	Nickel	5.1	B		P	
7440-09-7	Potassium	1140	B		P	
7782-49-2	Selenium	45.7			F	
7440-22-4	Silver	62.8		*	P	
7440-23-5	Sodium	603	B		P	
7440-28-0	Thallium	9.7	B	N	F	J DC
7440-62-2	Vanadium	2.6	B		P	
7440-66-6	Zinc	16200		E	P	
	Cyanide				NR	

Color Before: BROWN Clarity Before: Texture: FINE

Color After: YELLOW Clarity After: Artifacts:

Comments:

U.S. EPA - CLP

EPA SAMPLE NO.

1

INORGANIC ANALYSIS DATA SHEET

MHP502

Lab Name: SILVER VALLEY LABS., INC. Contract: ~~68-D9-0071~~ 68-W8-0094

Lab Code: SILVER Case No.: 12334 SAS No.: DC 9/13/89 SDG No.: MHL955

Matrix (soil/water): SOIL Lab Sample ID:

Level (low/med): LOW Date Received: 08/16/89

% Solids: 95.0

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	240		*	P	
7440-36-0	Antimony	144			P	
7440-38-2	Arsenic	175			P	J AS
7440-39-3	Barium	39.5	B	*	P	
7440-41-7	Beryllium	0.23	U		P	
7440-43-9	Cadmium	250			P	
7440-70-2	Calcium	32800			P	
7440-47-3	Chromium	0.59	U		P	
7440-48-4	Cobalt	3.2	B		P	
7440-50-8	Copper	265			P	
7439-89-6	Iron	87000			P	
7439-92-1	Lead	31600			P	
7439-95-4	Magnesium	142	B		P	
7439-96-5	Manganese	252			P	
7439-97-6	Mercury	~~42~~ 0	N	J AS	CV	DC 9/13/89
7440-02-0	Nickel	6.2	B		P	
7440-09-7	Potassium	680	B		P	
7782-49-2	Selenium	38.4			F	
7440-22-4	Silver	115		*	P	
7440-23-5	Sodium	117	B		P	
7440-28-0	Thallium	6.8	B	N	F	J AS
7440-62-2	Vanadium	0.57	U		P	
7440-66-6	Zinc	33800		E	P	
	Cyanide				NR	

Color Before: BROWN Clarity Before: Texture: MEDIUM

Color After: YELLOW Clarity After: Artifacts:

Comments:

U.S. EPA - CLP

EPA SAMPLE NO.

1

INORGANIC ANALYSIS DATA SHEET

MHP503

Lab Name: SILVER VALLEY LABS.,INC. Contract: ~~68-D9-0071~~ 68-W8-0094

Lab Code: SILVER Case No.: 12334 SAS No.: DC 4-13-89 SDG No.: MHL955

Matrix (soil/water): WATER Lab Sample ID:

Level (low/med): LOW Date Received: 08/16/89

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	26.6	B		P	
7440-36-0	Antimony	19.9	U		P	
7440-38-2	Arsenic	3.3	B	NW	F	
7440-39-3	Barium	51.5	B		P	
7440-41-7	Beryllium	1.1	U		P	
7440-43-9	Cadmium	2.0	B		P	
7440-70-2	Calcium	147000			P	
7440-47-3	Chromium	2.8	U		P	
7440-48-4	Cobalt	2.6	U		P	
7440-50-8	Copper	6.3	B		P	
7439-89-6	Iron	195			P	
7439-92-1	Lead	5.9	B	N*	F	
7439-95-4	Magnesium	36400			P	
7439-96-5	Manganese	223			P	
7439-97-6	Mercury	~~0.2~~ 2.0	U	N JRS	CV	DC 4-11-89
7440-02-0	Nickel	9.7	U		P	
7440-09-7	Potassium	2090	B		P	
7782-49-2	Selenium	1.4	U	N*	F	R AS
7440-22-4	Silver	1.6	U		P	
7440-23-5	Sodium	25200			P	
7440-28-0	Thallium	1.0	U		F	
7440-62-2	Vanadium	2.7	U		P	
7440-66-6	Zinc	419			P	
	Cyanide				NR	

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

U.S. EPA - CLP

EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MHPS04

Lab Name: SILVER VALLEY LABS., INC. Contract: ~~68-03-0071~~ 68-W8-0074

Lab Code: SILVER Case No.: 12334 SAS No.: DC 9-11-89 SDG No.: MHL955

Matrix (soil/water): WATER Lab Sample ID:

Level (low/med): LOW Date Received: 08/16/89

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	75.8	B		P	
7440-36-0	Antimony	19.9	U		P	
7440-38-2	Arsenic	5.6	B	N+	F	R AS
7440-39-3	Barium	52.5	B		P	
7440-41-7	Beryllium	1.1	U		P	
7440-43-9	Cadmium	2.2	B		P	
7440-70-2	Calcium	147000			P	
7440-47-3	Chromium	2.8	U		P	
7440-48-4	Cobalt	4.0	B		P	
7440-50-8	Copper	5.6	B		P	
7439-89-6	Iron	481			P	
7439-92-1	Lead	35.8		NS*	F	
7439-95-4	Magnesium	36200			P	
7439-96-5	Manganese	240			P	
7439-97-6	Mercury	0.2 ~~0~~	U	N I ~~B~~	CV	DC 9-11-89
7440-02-0	Nickel	9.7	U		P	
7440-09-7	Potassium	1920	B		P	
7782-49-2	Selenium	14.0	U	N*	F	R AS
7440-22-4	Silver	1.6	U		P	
7440-23-5	Sodium	24100			P	
7440-28-0	Thallium	1.0	U	W	F	
7440-62-2	Vanadium	2.7	U		P	
7440-66-6	Zinc	519			P	
	Cyanide				NR	

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

U.S. EPA - CLP

EPA SAMPLE NO.

1

INORGANIC ANALYSIS DATA SHEET

MHP506

Lab Name: SILVER VALLEY LABS., INC. Contract: ~~68-D9-0071~~ 68-W8-0074

Lab Code: SILVER Case No.: 12334 SAS No.: DC 9-13-89 SDG No.: MHL955

Matrix (soil/water): WATER Lab Sample ID:

Level (low/med): LOW Date Received: 08/16/89

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	24.6	B		P
7440-36-0	Antimony	19.9	U		P
7440-38-2	Arsenic	6.8	B	NW	F
7440-39-3	Barium	54.6	B		P
7440-41-7	Beryllium	1.1	U		P
7440-43-9	Cadmium	1.8	U		P
7440-70-2	Calcium	139000			P
7440-47-3	Chromium	2.8	U		P
7440-48-4	Cobalt	2.6	B		P
7440-50-8	Copper	2.9	B		P
7439-89-6	Iron	338			P
7439-92-1	Lead	6.2		N*	F
7439-95-4	Magnesium	34600			P
7439-96-5	Manganese	274			P
7439-97-6	Mercury	~~0.2~~ ~~2.9~~	U	~~N~~ ~~J~~ ~~AB~~	CV
7440-02-0	Nickel	9.7	U		P
7440-09-7	Potassium	1790	B		P
7782-49-2	Selenium	14.0	U	N*	F
7440-22-4	Silver	1.6	U		P
7440-23-5	Sodium	22900			P
7440-28-0	Thallium	1.0	U	W	F
7440-62-2	Vanadium	2.7	U		P
7440-66-6	Zinc	429			P
	Cyanide				NR

DC 9-11-89

R AB

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

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U.S. EPA - CLP

EPA SAMPLE NO.

1

INORGANIC ANALYSIS DATA SHEET

MHP507

Lab Name: SILVER VALLEY LABS., INC. Contract: ~~68-D9-0071~~ 68-W8-0074

Lab Code: SILVER Case No.: 12334 SAS No.: DC 9-13-89 SDG No.: MHL955

Matrix (soil/water): WATER Lab Sample ID:

Level (low/med): LOW Date Received: 08/16/89

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	370			P	
7440-36-0	Antimony	19.3	U		P	
7440-38-2	Arsenic	12.2		NS	F	
7440-39-3	Barium	59.1	B		P	
7440-41-7	Beryllium	1.1	U		P	
7440-43-9	Cadmium	1.8	U		P	
7440-70-2	Calcium	144000			P	
7440-47-3	Chromium	2.8	B		P	
7440-48-4	Cobalt	2.6	U		P	
7440-50-8	Copper	11.7	B		P	
7439-89-6	Iron	1200			P	
7439-92-1	Lead	122		N*	F	
7439-95-4	Magnesium	35600			P	
7439-96-5	Manganese	335			P	
7439-97-6	Mercury	0.2 ~~2.0~~	~~U~~ N	JB	CV	DC 9-11-89
7440-02-0	Nickel	9.7	U		P	
7440-09-7	Potassium	1980	B		P	
7782-49-2	Selenium	1.4	U	N*	F	RAB
7440-22-4	Silver	1.6	U		P	
7440-23-5	Sodium	23400			P	
7440-28-0	Thallium	1.0	U	W	F	
7440-62-2	Vanadium	2.7	U		P	
7440-66-6	Zinc	726			P	
	Cyanide				NR	

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

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U.S. EPA - CLP

EPA SAMPLE NO.

1

INORGANIC ANALYSIS DATA SHEET

MHP509

Lab Name: SILVER VALLEY LABS.,INC. Contract: ~~68-D9-0074~~ 68-W8-0094

Lab Code: SILVER Case No.: 12334 SAS No.: DC 9-13-89 SDG No.: MHL955

Matrix (soil/water): WATER Lab Sample ID:

Level (low/med): LOW Date Received: 08/16/89

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	11.5	U		P	
7440-36-0	Antimony	19.9	U		P	
7440-38-2	Arsenic	2.3	U	NW	F	
7440-39-3	Barium	14.9	B		P	
7440-41-7	Beryllium	1.1	U		P	
7440-43-9	Cadmium	1.8	U		P	
7440-70-2	Calcium	322000			P	
7440-47-3	Chromium	2.8	U		P	
7440-48-4	Cobalt	2.6	U		P	
7440-50-8	Copper	1.9	B		P	
7439-89-6	Iron	270			P	
7439-92-1	Lead	0.90	U	NW*	F	
7439-95-4	Magnesium	68700			P	
7439-96-5	Manganese	94.8			P	
7439-97-6	Mercury	~~0.2~~ 2.0	U	N J ~~R~~	CV	DC 9-11-89
7440-02-0	Nickel	9.7	U		P	
7440-09-7	Potassium	1480	B		P	
7782-49-2	Selenium	14.0	U	N*	F	R ~~R~~
7440-22-4	Silver	1.6	U		P	
7440-23-5	Sodium	47500			P	
7440-28-0	Thallium	1.0	U	W	F	
7440-62-2	Vanadium	2.7	U		P	
7440-66-6	Zinc	190			P	
	Cyanide				NR	

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

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U.S. EPA - CLP

EPA SAMPLE NO.

1

INORGANIC ANALYSIS DATA SHEET

MHP510

Lab Name: SILVER VALLEY LABS., INC. Contract: ~~68-B9-0071~~ 68-W8-0074

Lab Code: SILVER Case No.: 12334 SAS No.: DC 9/13/89 SDG No.: MHL955

Matrix (soil/water): WATER Lab Sample ID:

Level (low/med): LOW Date Received: 08/16/89

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	368			P	
7440-36-0	Antimony	19.9	U		P	
7440-38-2	Arsenic	9.4	B	NW	F	
7440-39-3	Barium	37.0	B		P	
7440-41-7	Beryllium	1.1	U		P	
7440-43-9	Cadmium	2.6	B		P	
7440-70-2	Calcium	333000			P	
7440-47-3	Chromium	2.8	U		P	
7440-48-4	Cobalt	3.8	B		P	
7440-50-8	Copper	12.9	B		P	
7439-89-6	Iron	1070			P	
7439-92-1	Lead	131		N*	F	
7439-95-4	Magnesium	70500			P	
7439-96-5	Manganese	2110			P	
7439-97-6	Mercury	0.2 ~~2.0~~	U	~~N J~~	CV	DC 9/11/89
7440-02-0	Nickel	9.7	U		P	
7440-09-7	Potassium	1710	B		P	
7782-49-2	Selenium	1.4	U	N*	F	RMB
7440-22-4	Silver	2.4	B		P	
7440-23-5	Sodium	48400			P	
7440-28-0	Thallium	1.0	U	W	F	
7440-62-2	Vanadium	2.7	U		P	
7440-66-6	Zinc	656			P	
	Cyanide				NR	

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

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U.S. EPA - CLP

EPA SAMPLE NO.

1

INORGANIC ANALYSIS DATA SHEET

MHP511

Lab Name: SILVER VALLEY LABS., INC. Contract: ~~68-D9-0071~~ 68-W8-0074

Lab Code: SILVER Case No.: 12334 SAS No.: DC 9-7-89 SDG No.: MHL955

Matrix (soil/water): WATER Lab Sample ID:

Level (low/med): LOW Date Received: 08/16/89

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	16.8	B		P	
7440-36-0	Antimony	19.9	U		P	
7440-38-2	Arsenic	5.3	B	NW	F	
7440-39-3	Barium	32.1	B		P	
7440-41-7	Beryllium	1.1	U		P	
7440-43-9	Cadmium	1.8	U		P	
7440-70-2	Calcium	320000			P	
7440-47-3	Chromium	2.8	U		P	
7440-48-4	Cobalt	2.6	U		P	
7440-50-8	Copper	1.1	U		P	
7439-89-6	Iron	224			P	
7439-92-1	Lead	0.90	U	N*	F	
7439-95-4	Magnesium	68600			P	
7439-96-5	Manganese	960			P	
7439-97-6	Mercury	~~0.2~~ 0.9	U	N J ~~AS~~	CV	DC 9-11-89
7440-02-0	Nickel	9.7	U		P	
7440-09-7	Potassium	1330	B		P	
7782-49-2	Selenium	14.0	U	N*	F	RAS
7440-22-4	Silver	1.6	U		P	
7440-23-5	Sodium	46700			P	
7440-28-0	Thallium	1.0	U	W	F	
7440-62-2	Vanadium	2.7	U		P	
7440-66-6	Zinc	295			P	
	Cyanide				NR	

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

U.S. EPA - CLP

EPA SAMPLE NO.

1

INORGANIC ANALYSIS DATA SHEET

MHP512

Lab Name: SILVER VALLEY LABS., INC. Contract: ~~68-D9-0071~~ 68-W8-0074

Lab Code: SILVER Case No.: 12334 SAS No.: DC 6/13/89 SDG No.: MHL955

Matrix (soil/water): WATER Lab Sample ID:

Level (low/med): LOW Date Received: 08/16/89

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	106	B		P	
7440-36-0	Antimony	19.9	U		P	
7440-38-2	Arsenic	8.4	B	N	F	
7440-39-3	Barium	33.5	B		P	
7440-41-7	Beryllium	1.1	U		P	
7440-43-9	Cadmium	1.8	U		P	
7440-70-2	Calcium	303000			P	
7440-47-3	Chromium	2.8	U		P	
7440-48-4	Cobalt	2.6	U		P	
7440-50-8	Copper	4.9	B		P	
7439-89-6	Iron	1090			P	
7439-92-1	Lead	36.6		NS*	F	
7439-95-4	Magnesium	64900			P	
7439-96-5	Manganese	950			P	
7439-97-6	Mercury	~~0.2~~ 2.0	U	N J ~~B~~	CV	DC 6/11/89
7440-02-0	Nickel	9.7	U		P	
7440-09-7	Potassium	986	B		P	
7782-49-2	Selenium	14.0	U	N*	F	R ~~B~~
7440-22-4	Silver	1.6	U		P	
7440-23-5	Sodium	44300			P	
7440-28-0	Thallium	1.0	U	W	F	
7440-62-2	Vanadium	2.7	U		P	
7440-66-6	Zinc	332			P	
	Cyanide				NR	

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

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U.S. EPA - CLP

EPA SAMPLE NO.

1

INORGANIC ANALYSIS DATA SHEET

MHP513

Lab Name: SILVER VALLEY LABS.,INC. Contract: ~~68-D9-0071~~ 68W8-0074

Lab Code: SILVER Case No.: 12334 SAS No.: DC 9-13-89 SDG No.: MHL955

Matrix (soil/water): WATER Lab Sample ID:

Level (low/med): LOW Date Received: 08/16/89

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	23.3	B		P
7440-36-0	Antimony	19.9	U		P
7440-38-2	Arsenic	2.3	U	N	F
7440-39-3	Barium	1.3	U		P
7440-41-7	Beryllium	1.1	U		P
7440-43-9	Cadmium	1.8	U		P
7440-70-2	Calcium	154	B		P
7440-47-3	Chromium	3.5	B		P
7440-48-4	Cobalt	2.6	U		P
7440-50-8	Copper	1.1	U		P
7439-89-6	Iron	277			P
7439-92-1	Lead	0.90	U	N*	F
7439-95-4	Magnesium	42.5	B		P
7439-96-5	Manganese	2.3	B		P
7439-97-6	Mercury	~~0.2~~ 2.9	U	~~N~~ J ~~S~~	CV
7440-02-0	Nickel	9.7	U		P
7440-09-7	Potassium	273	U		P
7782-49-2	Selenium	1.4	U	N*	F
7440-22-4	Silver	1.6	U		P
7440-23-5	Sodium	68.9	B		P
7440-28-0	Thallium	1.0	U	W	F
7440-62-2	Vanadium	2.7	U		P
7440-66-6	Zinc	4.5	B		P
	Cyanide				NR

DC 9-11-89

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

U.S. EPA - CLP

EPA SAMPLE NO.

1

INORGANIC ANALYSIS DATA SHEET

MHP514

Lab Name: SILVER VALLEY LABS.,INC. Contract: ~~68-D9-0071~~ 68-W8-0074

Lab Code: SILVER Case No.: 12334 SAS No.: DC 4/17/89 SDG No.: MHL955

Matrix (soil/water): WATER Lab Sample ID:

Level (low/med): LOW Date Received: 08/16/89

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	16.6	B		P
7440-36-0	Antimony	19.9	U		P
7440-38-2	Arsenic	12.0		NS	F
7440-39-3	Barium	1.3	U		P
7440-41-7	Beryllium	1.1	U		P
7440-43-9	Cadmium	1.8	U		P
7440-70-2	Calcium	56.3	B		P
7440-47-3	Chromium	2.8	U		P
7440-48-4	Cobalt	2.6	U		P
7440-50-8	Copper	4.4	B		P
7439-89-6	Iron	219			P
7439-92-1	Lead	0.90	U	NW*	F
7439-95-4	Magnesium	20.9	U		P
7439-96-5	Manganese	2.0	B		P
7439-97-6	Mercury	0.2 ~~5.0~~	U	~~NJ~~	CV
7440-02-0	Nickel	9.7	U		P
7440-09-7	Potassium	273	U		P
7782-49-2	Selenium	1.4	U	N*	F
7440-22-4	Silver	1.6	U		P
7440-23-5	Sodium	76.0	B		P
7440-28-0	Thallium	1.0	U	W	F
7440-62-2	Vanadium	2.7	U		P
7440-66-6	Zinc	1.3	U		P
	Cyanide				NR

DC 9-11-89

R ~~NB~~

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

U.S. EPA - CLP

EPA SAMPLE NO.

1

INORGANIC ANALYSIS DATA SHEET

MHP515

Lab Name: SILVER VALLEY LABS., INC. Contract: ~~68-D9-0071~~ 68-W8-0074

Lab Code: SILVER Case No.: 12334 SAS No.: DC 9-11-89 SDG No.: MHL955

Matrix (soil/water): WATER Lab Sample ID:

Level (low/med): LOW Date Received: 08/16/89

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	32.8	B		P	
7440-36-0	Antimony	39.3	B		P	
7440-38-2	Arsenic	68.6		N	F	
7440-39-3	Barium	102	B		P	
7440-41-7	Beryllium	1.1	U		P	
7440-43-9	Cadmium	4.6	B		P	
7440-70-2	Calcium	180000			P	
7440-47-3	Chromium	2.8	U		P	
7440-48-4	Cobalt	8.8	B		P	
7440-50-8	Copper	13.6	B		P	
7439-89-6	Iron	267			P	
7439-92-1	Lead	41.8		N*	F	
7439-95-4	Magnesium	38000			P	
7439-96-5	Manganese	2780			P	
7439-97-6	Mercury	~~0.2~~ 2.9	U	~~N J~~ *	CV	DC 9-11-89
7440-02-0	Nickel	9.7	U		P	
7440-09-7	Potassium	5580			P	
7782-49-2	Selenium	14.0	U	N*	F	R *
7440-22-4	Silver	1.6	U		P	
7440-23-5	Sodium	54600			P	
7440-28-0	Thallium	14.1			F	
7440-62-2	Vanadium	2.7	U		P	
7440-66-6	Zinc	2650			P	
	Cyanide				NR	

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

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U.S. EPA - CLP

EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MHP516

Lab Name: SILVER VALLEY LABS., INC. Contract: ~~68-D9-0071~~ 68-W8-0074

Lab Code: SILVER Case No.: 12334 SAS No.: DC 9-12-89 SDG No.: MHL955

Matrix (soil/water): WATER Lab Sample ID:

Level (low/med): LOW Date Received: 08/16/89

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	~~30900~~			P	
7440-36-0	Antimony	~~937~~		~~J~~ OK	P	
7440-38-2	Arsenic	~~2940~~		~~J~~	NF	DC 9-12-89
7440-39-3	Barium	2330			P	
7440-41-7	Beryllium	1.7	B		P	
7440-43-9	Cadmium	289			P	
7440-70-2	Calcium	446000			P	
7440-47-3	Chromium	50.2			P	
7440-48-4	Cobalt	48.7	B		P	
7440-50-8	Copper	1540			P	
7439-89-6	Iron	107000			P	
7439-92-1	Lead	22100			P	J
7439-95-4	Magnesium	104000			P	
7439-96-5	Manganese	21100			P	
7439-97-6	Mercury	~~16.0~~		N J	CV	DC 9-12-89
7440-02-0	Nickel	65.5			P	
7440-09-7	Potassium	15600			P	
7782-49-2	Selenium	1.2 ~~1~~	U	W ~~J~~	NF	DC 9-12-89 R
7440-22-4	Silver	201			P	
7440-23-5	Sodium	58500			P	
7440-28-0	Thallium	83.4			F	J
7440-62-2	Vanadium	58.7			P	
7440-66-6	Zinc	49100			P	
	Cyanide				NR	

lab doesn't multiply by dilution for SOX

Color Before: BROWN Clarity Before: CLOUDY Texture:

Color After: BROWN Clarity After: CLOUDY Artifacts:

Comments:

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U.S. EPA - CLP

EPA SAMPLE NO.

1

INORGANIC ANALYSIS DATA SHEET

MHP517

Lab Name: SILVER VALLEY LABS.,INC. Contract: ~~68-03-0071~~ 68-W8-0074

Lab Code: SILVER Case No.: 12334 SAS No.: DC 9-11-89 SDG No.: MHL955

Matrix (soil/water): WATER Lab Sample ID:

Level (low/med): LOW Date Received: 08/16/89

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	32.6	B		P	
7440-36-0	Antimony	19.9	U		P	
7440-38-2	Arsenic	10.7		N	F	J 48
7440-39-3	Barium	37.0	B		P	
7440-41-7	Beryllium	1.1	U		P	
7440-43-9	Cadmium	3.3	B		P	
7440-70-2	Calcium	308000			P	
7440-47-3	Chromium	2.8	U		P	
7440-48-4	Cobalt	2.6	U		P	
7440-50-8	Copper	12.4	B		P	
7439-89-6	Iron	416			P	
7439-92-1	Lead	12.9		N*	F	
7439-95-4	Magnesium	61600			P	
7439-96-5	Manganese	1310			P	
7439-97-6	Mercury	0.2 ~~2.9~~	U	~~N~~ I 48	CV	DC 9-11-89
7440-02-0	Nickel	25.8	B		P	
7440-09-7	Potassium	273	U		P	
7782-49-2	Selenium	14.0	U	N*	F	R 48
7440-22-4	Silver	1.6	U		P	
7440-23-5	Sodium	28800			P	
7440-28-0	Thallium	1.0	U		F	
7440-62-2	Vanadium	2.7	U		P	
7440-66-6	Zinc	2990			P	
	Cyanide				NR	

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

U.S. EPA - CLP

EPA SAMPLE NO.

1

INORGANIC ANALYSIS DATA SHEET

MHP518

Lab Name: SILVER VALLEY LABS., INC. Contract: ~~68-D9-0071~~ 68-W8-0074

Lab Code: SILVER Case No.: 12334 SAS No.: NC 9-17-89 SDG No.: MHL955

Matrix (soil/water): WATER Lab Sample ID:

Level (low/med): LOW Date Received: 08/16/89

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	33.7	B		P	
7440-36-0	Antimony	19.9	U		P	
7440-38-2	Arsenic	17.4		NS	F	J ~~B~~
7440-39-3	Barium	95.9	B		P	
7440-41-7	Beryllium	1.1	U		P	
7440-43-9	Cadmium	6.2			P	
7440-70-2	Calcium	314000			P	
7440-47-3	Chromium	2.8	U		P	
7440-48-4	Cobalt	2.6	U		P	
7440-50-8	Copper	5.6	B		P	
7439-89-6	Iron	696			P	
7439-92-1	Lead	24.9		N*	F	
7439-95-4	Magnesium	62700			P	
7439-96-5	Manganese	1340			P	
7439-97-6	Mercury	~~0.2~~ 0	U	N J ~~B~~	CV	D C 9-11-89
7440-02-0	Nickel	9.7	U		P	
7440-09-7	Potassium	273	U		P	
7782-49-2	Selenium	14.0	U	N*	F	R ~~B~~
7440-22-4	Silver	1.6	U		P	
7440-23-5	Sodium	29300			P	
7440-28-0	Thallium	1.0	U		F	
7440-62-2	Vanadium	2.7	U		P	
7440-66-6	Zinc	3060			P	
	Cyanide				NR	

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

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U.S. EPA - CLP

EPA SAMPLE NO.

1

INORGANIC ANALYSIS DATA SHEET

MHPS19

Lab Name: SILVER VALLEY LABS., INC. Contract: ~~68-D9-0074~~ 68-W8-0074

Lab Code: SILVER Case No.: 12334 SAS No.: DC 9-11-89 SDG No.: MHL955

Matrix (soil/water): WATER Lab Sample ID:

Level (low/med): LOW Date Received: 08/16/89

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	17.6	B		P
7440-36-0	Antimony	19.9	U		P
7440-38-2	Arsenic	2.3	U	NW	F
7440-39-3	Barium	14.9	B		P
7440-41-7	Beryllium	1.1	U		P
7440-43-9	Cadmium	1.8	U		P
7440-70-2	Calcium	316000			P
7440-47-3	Chromium	2.8	U		P
7440-48-4	Cobalt	2.6	U		P
7440-50-8	Copper	10.4	B		P
7439-89-6	Iron	426			P
7439-92-1	Lead	1.8	U	N*	F
7439-95-4	Magnesium	68200			P
7439-96-5	Manganese	3180			P
7439-97-6	Mercury	~~0.2~~ 2.0	U	~~N~~ J	CV
7440-02-0	Nickel	13.2	B		P
7440-09-7	Potassium	2010	B		P
7782-49-2	Selenium	14.0	U	N*	F
7440-22-4	Silver	1.6	U		P
7440-23-5	Sodium	45000			P
7440-28-0	Thallium	1.0	U		F
7440-62-2	Vanadium	2.7	U		P
7440-66-6	Zinc	219			P
	Cyanide				NR

DC 9-11-89

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Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments: